Ausgestaltung des Post 2012-Klimaregimes: Sektorale Ansätze zur THG-Emissionsminderung

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ENDBERICHT

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Summary

In 2010, at the Conference of the Parties (COP) 16 in Cancun, Parties decided to consider the establishment of market-based mechanisms at COP 17 in Durban 2011. These should be based on the principles of voluntary participation, cover “broad segments of the economy” (sectors), ensure environmental integrity and lead to a net decrease of GHG emissions. In addition, they shall be complementary to Nationally Appropriate Mitigation Actions (NAMAs), supplemental to domestic efforts in industrialised countries and have a robust market design as well as sound regulative rules. The Ad-hoc Working Group on Long-term Cooperative Action (AWG-LCA) had been requested to draft a decision for COP 17.

At the beginning of the research project, market-based mechanisms were still fundamentally opposed by Bolivia and Venezuela. Malaysia raised the issue that low cost abatement options in developing countries had been addressed through industrialised countries via market mechanisms, leaving only expensive abatement options for domestic action through the host country. Bangladesh and Tuvalu, amongst others, underlined that new mechanisms require a sound design avoiding market failure.

Broad support for market mechanisms came from the European Union (EU), the Alliance of Small Island States (AOSIS), Australia, Colombia, Ecuador, Japan, New Zealand, Norway, Papua New Guinea, Peru, South Korea, Singapore, Switzerland, Turkey and Russia. Even Saudi Arabia, which has so far not shown constructive behaviour in the debate about market-based mechanisms, has submitted a rather progressive position. China generally saw the establishment of new mechanisms as feasible, under the condition that the US commits to firm reductions.

Against this background we examined several issues relevant to a sound design of such a sectoral mechanism. The results of these analyses are briefly summarized in the following sections.

Incentives for mitigation investments

Compared to a project-based approach, sectoral mechanisms would result in a different role of emitters, investors and government. Under project-based mechanisms the host country government mainly has a supervising role while the economic responsibility remains with the project developer or project owner. Under a sectoral mechanism, the implementing country government would have a more active role and would have to ensure that the emission reductions are actually achieved because otherwise no revenues to cover additional costs for greenhouse gas mitigation measures would be achieved. Against this background we scrutinise whether the shift in responsibility from emitters or investors to implementing country government would limit or even eliminate emitters’ incentives to engage in seeking cost-effective mitigation options and, if so, by which means such an outcome could be avoided or limited. We analyse the challenges which may be caused by the different responsibility structure, discuss the extent to which potential instruments and measures can provide the required incentive to look for cost-effective greenhouse gas mitigation options and provide a summary of the views of selected actors as well as a synopsis of relevant experiences gained so far in this context. We find that sectoral mechanisms involve strong governance skills of government in implementing climate policy and identify a number of potential policy instruments which would provide the required mitigation incentives with different degrees of direct or indirect linking with the global carbon

market. As a conclusion we find that pilot implementations would help to establish confidence in the new mechanism and encourage its broader application.

Challenges for monitoring, reporting and verification

The new market-based mechanisms (NMM) will require a monitoring, reporting and verification (MRV) system that enables transparent accounting of their contribution to greenhouse gas (GHG) emission reductions. This discussion paper analyses how such a MRV system for the new market-based mechanisms can be designed so that it complies with the criteria of environmental integrity, data availability, transparency, cost efficiency, a sound institutional framework and transferability. To do so, the general academic and political discussion on MRV is summarised in a first step; then, lessons are drawn from existing MRV systems; finally, proposals are put forward for the MRV of new sectoral market-based mechanisms.

In terms of designing a MRV system for NMM, the Clean Development Mechanism (CDM) can firstly provide a good starting point with its established methodologies, rules and institutions. However, its framework has to be adapted when moving from the project to the sectoral level because, for example, the role of national MRV institutions will be more important. Secondly, the European Union's Emissions Trading Scheme (EU ETS) provides important lessons for the set-up of institutions and MRV of data at the sectoral level (flexibility needed, tiered approach of data accuracy, etc.). Thirdly, new data collection, reporting and verification systems for developing countries are being currently negotiated, including systems for internationally supported and non-supported NAMAs, and for biennial updates of national emission inventories. While all these systems have not yet been implemented, the MRV of NMM should be consistent with these systems to avoid double counting and overlaps.

From the analysis of the EU ETS and CDM methodologies covering sectors (buildings, cement and power), we derive the following institutional and data requirements for a credible MRV system of new market-based mechanisms:

- Regarding institutions, various national and international institutions will need to be created. Particularly the national ones will be important, as it is in the EU ETS, as data from whole sectors has to be monitored and reported. We assume that at least a national coordination entity and national regulations are required.

- At the international level, we propose to establish an institutional architecture that is very similar to the one of the CDM: a governing body taking politically sensitive decisions, several technical groups as well as an administrative support unit assisting the governing body, and internationally accredited verifiers who are responsible for time-consuming tasks. However, the concrete role of bodies will very much depend on the post-2012 architecture of the climate regime.

- The most important conclusion is that MRV of NMM will very much depend on the outcome of the climate negotiations, mainly whether NMM are governed in an internationally coordinated way or not. An internationally coordinated MRV system would more easily ensure environmental integrity because of common rules and accounting. However, a rather uncoordinated system is not unlikely given the current negotiations. Therefore, more analysis has to be conducted on institutions and MRV guidelines required to ensure a minimum of environmental integrity of NMM in the case of an internationally uncoordinated regime.

Setting baselines

The establishment of a NMM for the climate change regime post-2012 was decided upon in December 2011 during COP 17 in Durban, with a view to defining its modalities and procedures during 2012. One of the crucial design elements to consider when establishing market-based mechanisms is the definition of a reference scenario or baseline for setting emission targets and calculating emission reductions. In this paper we consider approaches for setting baselines for a sectoral-level NMM (sectoral crediting or sectoral trading). We define the baseline as the expected development of GHG emissions under the assumption that no new mitigation measures would be taken, i.e. under a business-as-usual scenario.

We first review the literature on the different design components of baselines: scope or level of aggregation, reference data, dynamics and updating, metrics, conservativeness and stringency level. Then we present a set of evaluation criteria for assessing the appropriateness of different baseline designs for a NMM: environmental integrity, transparency, flexibility and data requirements. We present and discuss possible sectoral baseline designs for three economic sectors: power, cement and buildings. The baselines are developed on the basis of aggregated historical sector-level emission trends, data on sector composition (e.g. fuels and technologies used, products, geographic specificities) and future demand projections. The selection of sectors allows the complexities of setting baselines in sectors with large-scale installations (power and cement) and in those with dispersed installations (buildings) to be considered. It also allows assessment of different design possibilities for cases in which sectors comprise heterogeneous technologies and installation types. Both absolute and indexed baselines are considered, and they are compared to potential emission targets for the sector. We rely both on extrapolations of historical emissions paths and more complex projections of emissions on the basis of regressions on important emission drivers to estimate baselines up to the year 2030. We also discuss more complex modelling tools that have been used, e.g. in the buildings sector.

The results show that data quality and the transparency of assumptions are crucial for setting a realistic baseline that leads to an environmentally credible sectoral target or emissions threshold. The coverage of the data (in terms of both scope and in time) is important, and the availability of disaggregated data not only on emission levels but also on emission drivers (types of technologies, plant vintages, fuels used, etc.) can improve the accuracy of the baseline, but needs to be weighed against costs, simplicity and transparency. Developers of sectoral baselines need to be transparent about data, methods and assumptions made in the projections, and should ideally show through sensitivity analyses that their projections are robust in terms of changes in some critical assumptions, and that they are realistic in terms of what a technology can (and should) achieve. At the level of the United Nations Framework Convention on Climate Change (UNFCCC), a fundamental decision needs to be taken about how much flexibility should be granted to baseline developers versus how much needs to be defined ex-ante through guidelines and default parameters.

Institutional design

A key issue in the design of the NMM is whether it would be coordinated internationally ex ante or whether Parties would establish their own market-based schemes and try then ex post to link these schemes in order to enhance the coverage of the carbon market and thus increase efficiency. Basically both approaches would be feasible. However, the first approach may postpone an agreement since negotiations may need longer discussions before an agreement among all Parties could be reached. The latter approach may seem to be quicker since Parties could build up their own market-based schemes right away. Nevertheless, linking with other market-based schemes may take even longer or may not be possible at all since their designs may be too different and diverse.

Two further disadvantages of the uncoordinated approach are: i) If there is no common international standard on the environmental stringency and the level of ambition, each party which intends to link its market-based scheme with another party's market-based approach has to scrutinise whether the other party's scheme is comparable in its design and does not undermine the Party's own scheme. As long as there are only a few Parties who want to link their scheme, this may be straightforward. However, if a tenth country wants to link with nine others, then its scheme would have to be scrutinised by nine other countries while the tenth country would have to scrutinise nine other market-based schemes – unless countries who have linked their scheme do not actually start to coordinate internationally. ii) If two countries are already linked and are approached by a third country and one country were to assess the third country's scheme as too weak and not linkable with its own scheme, this country would need to insist that the other country does not link with the third country either. Otherwise the rejection of the first country would be undermined by the acceptance of the second already linked party. Extending the coverage of linked countries would thus always require the agreement of already linked countries. Extending the coverage would need to follow accession rules as they are applied in the WTO or in the EU. Experience shows that this is a time-consuming process.

In addition to these disadvantages it has to be taken into account that schemes which comply with significantly different standards in terms of environmental integrity need to be kept separate and cannot be linked. Otherwise the scheme with the lowest standard would trigger a race to the bottom and thus finally establish the standard for the entire scheme. Keeping the market-based scheme separate would, however, result in lower economic efficiency and would thus certainly not be an optimal solution.

Draft modalities and procedures

The purpose of this paper was to provide a straw man proposal that can act as a starting point for discussions at EU level on actual textual proposals to be put forward in the run-up to COP 18 in November 2012 in Doha, Qatar. The draft was based on the EU's submission of March 2012 on the modalities and procedures for a new market mechanism under the Convention, on the modalities and procedures for a Clean Development Mechanism (3/CMP.1), the Cancun Agreements (1/CP.16), on the LWG-LCA outcome of Durban (2/CP.17) and on relevant research papers. The draft included sections on definitions, institutions, modalities and one section on procedures. In addition, several annexes were identified, which would need to be further elaborated once an agreement on the core modalities and procedures of a new market-based mechanism would have been reached.

This paper was not published but only submitted to the Directorate-General for Climate Action (DG CLIMA), which focused on a similar research and consultancy project on legal aspects of the design of a new market-based mechanism. These legal aspects were therefore not elaborated further in this paper. Together both documents were used as a basis for a submission of the European Union on draft modalities and procedures for the new market-based mechanism.

Capacity building

The NMM can take many forms; international negotiations on its design have just started. Looking at the experiences with capacity building for the Kyoto Mechanisms, capacity building for the NMM should be designed in a way that aims at a) enabling an informed participation of policy makers in the negotiations about advantages/disadvantages of approaches as well as possible designs of the NMM, b) allowing the potential for use of the NMM in the implementing country to be effectively harnessed, i.e. capacity building on domestic implementation, c) ensuring real ownership in the implementing country and d) efficient spending of support funds.

Based on past experience we recommend establishing capacity building programmes as multi-tier approach with a careful selection of the relevant target groups. In the initial phase of NMM, policymakers should be targeted as they negotiate internationally. It is important for them to understand the opportunities, challenges and barriers of a NMM for their country and to highlight the importance of domestic policy instruments which provide correct incentives for private sector mitigation investments. Once the design of NMM has been decided at UN level, it will be important to train both public institutions and the private sector in the host country about how to implement and engage in NMM. Phase I could be conducted in a style similar to the one successfully applied in the European Capacity Building Initiative (ECBI); i.e. through informal, facilitated discussions of policy makers that allow a comparatively open dialogue based on inputs through expert presentations.

We therefore recommend that the German government tenders, for example, three pilot implementations of the NMM in which Germany would buy the generated credits. Countries could, for instance, be defined as eligible for bidding if they have reached the third phase of PMR. In order to generate a credible incentive, the pilot phase should run for 4-5 years (e.g. from 2015 to 2020), and the credit volume should be significant, e.g. exceed 100 million tons CO_2e. Other donors could contribute financially. Selection criteria could be appropriateness of the NMM concept in the context of the country's mitigation potential, the willingness to provide co-finance and the existence of a NMM strategy that involves all key stakeholder groups, thus showing ownership. Moreover, the incentives to actually trigger mitigation should be scrutinised regarding their potential effectiveness.

Piloting implementation

The UNFCCC aims to build the rules and procedures of a NMM in the coming years. NMM pilot activities are desirable to inform UNFCCC rulemaking as well as to convince implementing countries that the NMM is an attractive carbon market mechanism. Therefore it is recommended that the German government engages in NMM pilot activities with selected partner countries and possibly jointly with other industrialized countries.

Based on a checklist exercise for gathering the required information in a formalised manner, it has been identified that it would be feasible to use the Peruvian residential sector as a pilot for

NMM implementation. Peru fulfils the generic participation requirements and has been actively engaged in pushing market instruments in the field of climate change, both on the national and international level. The institutional framework allows for a relatively professional handling of an NMM activity. Currently no major national initiatives target the sector in the sense that the NMM activity would do. On the other hand there is strong political commitment towards fighting climate change and also the residential sector has been identified as a potential contributor to reducing GHG emissions in Peru. MRV arrangements and baseline definition for the sector are in their infancy, and so is the projection for emission reductions. Robust calculations for baselines and projections, and robust design for the MRV system are to be developed. While it is apparent that the NMM activity would result in positive co-benefits, the country requires support to implement it successfully. This comprises finance, technical aid and capacity building, of which all need to be defined further.

The short assessment for Peru makes clear that the current provisions put forward in country submissions are relatively easy to meet if the implementing country is generally positive towards market mechanisms. But the assessment also shows that to a certain degree international requirements for baselines and MRV will require host countries to provide data, run complex studies and set up robust schemes. This can become a major challenge for pilot implementations of the NMM.

Conclusion

In 2010 in Cancun, Parties agreed to consider the establishment of market-based mechanisms covering broad segments of the economy at the next COP in Durban. During the latter the new-market-based mechanism (NMM) was actually defined. In addition Parties agreed in Durban to conduct a work programme in 2012 with a view to developing modalities and procedures for the implementation of the NMM.

In the course of 2012 it was, however, not possible to develop a draft of the modalities and procedures for adoption at COP 18 in Doha. It became clear that the views of Parties are still far apart. Some developed countries, particularly the United States (USA), Japan and New Zealand, dislike any approval of NMM implementation at UNFCCC level and prefer a pure transparency approach (Framework for Various Approaches, FVA) without any third party review which might result in corrections. Some developing countries, particularly Brazil, China and India, highlight the current lack of demand for any market-based approach. Generally they would prefer the coordinated approach suggested by the EU but would put it into force only if the level of mitigation ambition of developed countries were increased significantly. Some other countries, such as Papua New Guinea (PNG) agree to a large extent with the EU’s proposal but prefer to extend the NMM to sectors such as forestry which the EU cannot accept under the NMM, at least not at this point in time.

Against this background it can be questioned whether the negotiations in the run-up to COP 21 in Paris will ever be able to agree on a joint understanding of the NMM. Moreover, if the result of Durban is taken literally, i.e. if it is assumed that all parties will agree to commitments in 2015 covering all sectors, then it can also be asked whether a sectoral approach, the concepts of which stem from the period before Copenhagen, is of any additional value for the future regime after 2020.

Instead of trying to find an agreement on market-based mechanisms covering broad segments of the economy, Parties should focus on the more general discussion under the Ad-hoc Working Group on the Durban Platform (ADP) and determine the extent to which flexibility in implementing economy-wide targets under the ADP will be required and by what means such flexibility can be provided.

Zusammenfassung

Im Jahr 2010 bei der Klimakonferenz in Cancun (COP 16) entschieden die Vertragsstaaten, die Etablierung neuer marktbasierter Mechanismen bei der COP 17 im Jahr 2011 in Durban zu erwägen. Diese sollten auf den Prinzipien freiwillige Teilnahme, Erfassung umfassender Segmente der Gesamtwirtschaft (Sektoren), Sicherstellung der Umweltintegrität und Nettominderung von Treibhausgasen (THG) basieren. Darüber hinaus sollen sie zusätzlich zu National angepassten Minderungsaktivitäten (NAMAs) in Entwicklungsländern und zu Minderungsaktivitäten in Industrieländern sein. Ferner soll das Marktdesign robust und der Regulierungsrahmen solide sein. Die Ad-hoc Arbeitsgruppe zu langfristigen gemeinsamen Aktivitäten (AWG-LCA) wurde beauftragt einen Entscheidungsentwurf für COP 17 zu entwerfen.

Zu Beginn des Forschungsvorhabens wurden marktbasierte Mechanismen weiterhin von Bolivien und Venezuela abgelehnt. Malaysia wies darauf hin, dass kostengünstige Minderungsoptionen in Entwicklungsländern von den Industrieländern mittels Marktmechanismen bereits erschlossen wurden und nur noch kostspielige Minderungsoptionen für nationale Minderungsmaßnahmen der Gastgeberländer übrig blieben. Bangladesch und Tuvalu haben, neben anderen, betont, dass neue Mechanismen solide ausgestaltet werden müssen um ein Scheitern zu verhindern.

Klare Unterstützung für Marktmechanismen kam von der Europäischen Union (EU), der Allianz der kleinen Inselstaaten (AOSIS), Australien, Kolumbien, Ekuador, Japan, Neuseeland, Norwegen, Papua Neuguinea, Peru, Südkorea, Singapur, Schweiz, Türkei und Russland. Selbst Saudi Arabien, das bis dahin nicht durch konstruktives Verhalten in der Debatte über marktbasierte Mechanismen aufgefallen war, hat eine vergleichsweise fortschrittliche Position eingebracht. China hielt die Etablierung von neuen Marktmechanismen grundsätzlich für möglich, vorausgesetzt dass sich die USA zu verbindlichen Reduktionen verpflichtet.

Vor diesem Hintergrund haben wir verschiedene Fragestellungen analysiert, die für eine solide Ausgestaltung sektoraler Mechanismen relevant sind. Die Ergebnisse dieser Analysen sind in den folgenden Abschnitten kurz zusammengefasst.

Anreize für Minderungsinvestitionen

Im Vergleich zu projekt-basierten Mechanismen führen sektorale Mechanismen zu einer Veränderung der Rollen von Emittenten, Investoren und Regierungen. Bei einem projekt-basierten Ansatz hat die Regierung des Gastlandes im Wesentlichen eine überwachende Rolle, während die ökonomische Verantwortung beim Eigentümer des Projekts oder beim Projektentwickler verbleibt. Unter einem sektoralen Mechanismus würde die Regierung eine aktivere Rolle übernehmen und müsste sicherstellen, dass die Emissionsreduktionen tatsächlich auch erzielt werden, da ansonsten die Erträge zur Finanzierung der Treibhausgasminderungsmaßnahmen nicht erbracht werden könnten. Vor diesem Hintergrund untersuchen wir, ob der Wechsel in der Verantwortung die Anreize für die Suche nach kostengünstigen Minderungsoptionen mindern oder beseitigen würde und, falls ja, durch welche Maßnahmen eine solche Wirkung verhindert oder begrenzt werden kann. Wir analysieren die Herausforderungen, die sich aus der veränderten Verantwortungsstruktur ergeben, diskutieren, inwieweit verschiedene Instrumente und Maßnahmen, die erforderlichen Anreize zur Suche nach kostengünstigen Treibhausgasminderungsoptionen bieten können, und liefern eine Zusammenfassung der Standpunkte ausgewähl-

ter Akteure sowie eine Übersicht über bisher in diesem Zusammenhang gemachte, relevante Erfahrungen. Wir stellen fest, dass sektorale Mechanismen eine solide Steuerungsfähigkeit der jeweiligen Regierung bei der Umsetzung von Klimapolitik erfordern und identifizieren mehrere potenzielle Instrumente, die die notwendigen Minderungsanreize mit unterschiedlichem Grad direkter oder indirekter Einbindung in den globalen Kohlenstoffmarkt bieten. Als Schlussfolgerung stellen wir fest, dass Pilotumsetzungen dazu beitragen würden, das erforderliche Vertrauen für den neuen Mechanismus zu etablieren und eine breitere Anwendung fördern würden.

Herausforderungen für Monitoring, Berichterstattung und Verifizierung

Der neue Marktmechanismus (NMM) benötigen ein System zur Überwachung, Berichterstattung und Überprüfung (MRV), das eine transparente Anrechnung von Emissionsminderungen ermöglicht. Dieses Diskussionspapier untersucht, wie ein solches MRV-System für den NMM ausgestaltet werden kann, damit die Kriterien ökologische Integrität, Datenverfügbarkeit, Transparenz, Kosteneffizienz, solider institutioneller Rahmen und Übertragbarkeit erfüllt werden. In einem ersten Schritt wird die allgemeine wissenschaftliche und politische Diskussion über MRV zusammengefasst, dann Erkenntnisse aus bestehenden MRV-Systemen gezogen und schließlich weitere Vorschläge für das MRV des NMM aufgeführt.

Zur Ausgestaltung eines MRV-Systems für NMM kann erstens der Clean Development Mechanismus (CDM) mit den etablierten Methoden, Regeln und Institutionen eine gute Ausgangsbasis bieten. Allerdings müssen die Rahmenbedingungen für den Wechsel von der Projekt- zur Sektorebene angepasst werden, da zum Beispiel die Rolle der nationalen MRV-Institutionen wichtiger sein wird. Zweitens bietet das Emissionshandelssystem der Europäischen Union (EU ETS) auf sektoraler Ebene wichtige Erkenntnisse für den Aufbau von Institutionen und MRV-Daten (benötigte Flexibilität, mehrstufiger Ansatz der Datengenauigkeit, etc.). Drittens werden derzeit für Entwicklungsländer neue Systeme für Datenerhebung, Berichterstattung und Verifizierung einschließlich Systemen für international geförderte oder nicht geförderte NAMAs sowie die Aktualisierung der zweijährigen nationalen Emissionsinventare verhandelt. Obwohl diese Systeme bisher noch nicht umgesetzt wurden, sollte MRV für NMM konsistent mit diesen Systemen sein, um Doppelzählungen und Überlappungen zu vermeiden.

Aus der Analyse der im EU ETS und CDM erfassten Sektoren (Gebäude, Strom und Zement) leiten wir folgende institutionelle Voraussetzungen und Datenanforderungen für ein glaubwürdiges MRV-System der neuen Marktmechanismen ab:

- In Bezug auf Institutionen müssen verschiedene nationale und internationale Institutionen geschaffen werden. Insbesondere sind die nationalen Institutionen wichtig, sehr ähnlich wie beim EU ETS, da die Daten aus gesamten Sektoren überwacht und berichtet werden müssen. Wir gehen davon aus, dass mindestens eine nationale Koordinationsstelle sowie nationale Vorschriften dafür erforderlich sind.

- Wir schlagen vor, auf internationaler Ebene eine institutionelle Struktur aufzubauen, die dem CDM sehr ähnlich ist: eine Regulierungsinstitution, die politisch sensible Entscheidungen trifft, mehrere technische Arbeitsgruppen, eine administrative Einheit zur Unterstützung der Regulierungsinstitution sowie international akkreditierte Verifizierer, die die zeitaufwendigen Aufgaben übernehmen. Allerdings wird die konkrete Rolle dieser Institutionen sehr stark von der post-2012-Architektur abhängen.

- Das wichtigste Fazit: MRV für den NMM wird sehr stark vom Ergebnis der Klimaverhandlungen abhängen, vor allem ob der NMM international koordiniert wird oder nicht. Ein international koordiniertes MRV-System würde aufgrund der gemeinsamen Regeln und Bilanzierungen leichter die ökologische Integrität sicherstellen. Allerdings ist ein eher unkoordiniertes System angesichts der laufenden Verhandlungen nicht unwahrscheinlich. Im Fall einer international unkoordinierten Regelung müssen mehr Analysen von Institutionen durchgeführt und MRV-Richtlinien geschaffen werden, um ein Minimum ökologischer Integrität von NMM zu gewährleisten.

Bestimmung von Baselines

Die Einrichtung eines neuen Marktmechanismus zur Klimapolitik nach 2012 wurde im Dezember 2011 während der COP 17 in Durban beschlossen, mit der Absicht ihre Modalitäten und Verfahren noch im Jahr 2012 festzulegen. Einer der entscheidenden Gestaltungselemente, die zur Gründung marktbasierter Mechanismen dazugehört, ist die Festlegung eines Referenzszenarios oder einer Baseline für die Bestimmung von Emissionszielen und für die Berechnung von Emissionsreduktionen. In diesem Bericht betrachten wir Ansätze für die Festlegung dieser Baselines auf sektoraler NMM-Ebene (sektorale Kreditierung oder sektoraler Handel). Wir definieren die Baseline als eine erwartete Entwicklung der Treibhausgasemissionen unter der Annahme, dass keine neuen Verminderungsmaßnahmen gemacht werden, d.h. entsprechend einem Business-as-usual-Szenario.

Wir haben zuerst die Literatur zu den verschiedenen Gestaltungselementen von Baselines analysiert: Umfang oder Höhe der Aggregation, Referenzdaten, Dynamik und Aktualisierung, Metriken, Konservativität und Stringenz. Dann präsentieren wir eine Reihe von Kriterien zur Bewertung der Eignung verschiedener möglicher Baselines für den NMM: ökologische Integrität, Transparenz, Flexibilität und Datenanforderungen. Wir präsentieren und diskutieren mögliche sektorale Baselines für drei Wirtschaftssektoren: Strom, Zement und Gebäude. Die Baselines werden auf der Grundlage von sektoral aggregierten historischen Emissionstrends, Daten zur Branchenstruktur (z. B. Kraftstoffe und Technologien betreffend, Produkte, geografische Besonderheiten) und Nachfrageprojektionen entwickelt. Die Auswahl der Sektoren ermöglicht eine komplexe Bestimmung von Baselines in Sektoren mit Großanlagen (Strom und Zement) und verteilten Anlagen (Gebäude) in Betracht zu ziehen. Sie ermöglicht auch eine Bewertung verschiedener Ausgestaltungsmöglichkeiten im Falle von Sektoren mit heterogene Technologien und Anlagentypen. Es werden sowohl absolute als auch indizierte Baselines betrachtet und anhand potenzieller Emissionsziele für diese Sektoren verglichen. Wir nutzen sowohl Extrapolationen historischer Emissionspfade, als auch Projektionen auf der Basis von komplexeren emissionstreiberbasierten Regressionsmodellen, um Baselines bis 2030 abzuschätzen. Außerdem diskutieren wir komplexere Modellierungsinstrumente, die z.B. im Gebäudebereich verwendet wurden.

Die Ergebnisse zeigen, dass die Qualität der Daten und die Transparenz der Annahmen von entscheidender Bedeutung für die Bestimmung einer realistischen Baseline sind, die zu ökologisch glaubwürdigen sektoralen Emissionszielen oder Emissionsschwellwerten führen. Der Erfassungsgrad der Daten (sowohl in geographischer wie zeitlicher Hinsicht) spielt dabei eine wichtige Rolle. Die Verfügbarkeit disaggregierter Daten, nicht nur in Bezug auf Emissionen, sondern auch auf die Emissionstreiber (Technologieart, Anlagenbaujahr, Brennstoff, etc.), können die Genauigkeit der Baseline verbessern, was aber im Hinblick auf Kosten, Einfachheit und Transparenz abgewogen werden muss. Entwickler von sektoralen Baselines müssen transparent sein hinsichtlich ihrer Daten, Methoden und Projektionsannahmen. Sie sollten idealerweise durch Sensitivitätsanalysen zeigen, dass die Baselines im Hinblick auf kritische Annahmeveränderungen hinreichend robust sind und dass Annahmen, was eine Technologie erreichen kann (und soll), realistisch sind. Auf Ebene der Klimarahmenkonvention (UNFCCC) muss eine grundsätzliche Entscheidung darüber gefällt werden, wie viel Flexibilität Entwicklern von Baselines gewährt werden kann und wie viel vorab durch Richtlinien und Default-Parameter definiert werden sollte.

Institutionelles Design

Ein zentrales Thema bezüglich des NMM ist, ob seine Ausgestaltung vorab international koordiniert werden soll oder ob die Vertragsstaaten zunächst ihre eigenen marktbasierten Systeme etablieren um sie später mit anderen Systemen zu verknüpfen, um auf diese Weise eine Erweiterung des globalen Kohlenstoffmarktes und den damit verbundenen Effizienzsteigerungen zu erzielen. Grundsätzlich wären beide Ansätze machbar. Allerdings kann der erste Ansatz eine Vereinbarung hinauszögern, da längere Verhandlungen notwendig wären, um eine für alle Vertragsstaaten akzeptable Vereinbarung zu finden. Der zweite Ansatz scheint schneller zu funktionieren, da Vertragsstaaten ihre eigenen marktbasierten Systeme sofort aufbauen könnten. Dennoch kann die Verknüpfung mit anderen marktbasierten Systemen länger dauern oder auch überhaupt nicht zustande kommen, da die Designs möglicherweise zu unterschiedlich und vielzählig sind.

Zwei weitere Nachteile des unkoordinierten Ansatzes sind: i) Wenn es keinen gemeinsamen internationalen Standard für Umweltintegrität und Ambitionsniveau gibt und wenn jeder Vertragsstaat, sein marktbasiertes System mit einem anderen marktorientierten Vertragsstaaten verknüpfen möchte, hinterfragen muss, ob die Regelung des anderen Vertragsstaats vergleichbar ist und ob das eigen System durch die Verknüpfung nicht unterminiert wird. Solange es nur wenige Staaten gibt, die eine Verknüpfung ihrer Regelungen anstreben, könnte dies unproblematisch erfolgen. Wenn allerdings ein zehntes Land sich mit neun anderen verbinden möchte, dann muss einerseits dieses System des zehnten Landes von den neun anderen geprüft werden und andererseits die neun anderen marktbasierten Systeme vom zehnten Land geprüft werden – es sei denn, die Länder, die ihre Systeme verknüpft haben, sind an einer Koordination ihrer Systeme gar nicht interessiert. ii) Wenn zwei Länder bereits verknüpft sind und von einem Drittland angeworben werden und es würde sich herausstellen, dass das eine Land das Drittlandsystem als zu schwach bewertet und es somit mit dem eigenen System nicht verknüpfbar ist, dann müsste das erste Land darauf bestehen, dass das zweite Land sich nicht mit dem Drittland verbinden darf. Andernfalls würde die Ablehnung des ersten Landes die Annahme des zweiten Landes, welches bereits verlinkt ist, untergraben. Die Ausweitung der bereits verbundenen Länder würde immer die Zustimmung der bereits verlinkten Länder benötigen. Diese Ausweitung erfordert Beitrittsregelungen, wie sie im Rahmen der WTO oder in der EU aufzufinden sind. Die bisherigen Erfahrungen zeigen, dass dies ein langwieriger Prozess ist.

Neben diesen Nachteilen ist zu berücksichtigen, dass Systeme, die mit erheblichen unterschiedlichen Standards in Bezug, auf die ökologische Integrität, getrennt zu halten sind und nicht verknüpft werden können. Ansonsten würde das System mit dem niedrigsten Standard einen Wettlauf nach unten auslösen und damit schließlich den Standard des ganzen Systems beeinflussen. Werden die marktbasierten Systeme jedoch separat gehalten, so würde dies zu einer geringeren Wirtschaftlichkeit führen und damit sicherlich nicht zu einer optimalen Lösung.

Entwurf von Umsetzungsregeln

Der Zweck dieses Papiers war es, einen Entwurf als Ausgangspunkt für die Diskussionen auf EU-Ebene zu erarbeiten und Textvorschläge im Vorfeld der COP 18 im November in Doha, Katar zu unterbreiten. Der Entwurf wurde basierend auf der EU-Eingabe zu Modalitäten und Verfahren (Modalities & Procedures) für einen neuen Marktmechanismus unter der Klimarahmenkonvention vom März 2012 erstellt. Ferner wurden auch die Modalitäten und Verfahren für einen Clean Development Mechanismus (3/CMP.1), die Vereinbarungen von Cancún (1/CP.16), das LWG-LCA Ergebnis von Durban (2/CP.17) sowie relevante Forschungsarbeiten herangezogen. Der Entwurf enthält Abschnitte über Definitionen, Institutionen, Modalitäten und Verfahren. Darüber hinaus wurden mehrere Anhänge identifiziert, die weiter ausgearbeitet werden müssen, sobald eine Einigung über die Modalitäten und Verfahren des neuen marktbasierten Mechanismus erreicht wurde.

Dieses Paper wurde nicht veröffentlicht, sondern lediglich der Generaldirektion für Klimapolitik (DG CLIMA) übergeben, die sich in einem ähnlichen Forschungs- und Beratungsprojekt auf die rechtlichen Aspekte des Designs des NMM konzentrierten. Diese rechtlichen Aspekte wurden daher in diesem Papier nicht weiter ausgearbeitet. Gemeinsam wurden beide Dokumente als Basis für den Entwurf der EU zu Modalitäten und Verfahren für den NMM verwendet.

Capacity Building

Der NMM kann viele Formen annehmen. Internationale Verhandlungen über seine Ausgestaltung haben gerade erst begonnen. Mit Blick auf die Erfahrungen mit Capacity Building bei Kyoto-Mechanismen, sollte die Ausgestaltung des Capacity Building für den NMM folgende Ziele erfüllen: a) die Befähigung der politischen Entscheidungsträger zu einer informierten Teilnahme an den Verhandlungen über Vor- und Nachteile von Ansätzen sowie über eine mögliche Ausgestaltungen des NMM, b) eine effektive Nutzung des NMM-Potenzials im Umsetzungsland, d.h. Fortbildung bezüglich nationaler Umsetzung, c) echte Eigenverantwortung im Umsetzungsland und d) effiziente Ausgaben der Unterstützungsgelder.

Aufgrund bisheriger Erfahrungen empfehlen wir den Ausbau von Fortbildungsprogrammen als mehrstufigen Ansatz mit einer sorgfältigen Auswahl relevanter Zielgruppen. In der Anfangsphase des NMM sollten die politischen Entscheidungsträger adressiert werden, da sie international verhandeln. Es ist wichtig, die Chancen, Herausforderungen und Hindernisse des NMM für ihr Land zu verstehen und die Bedeutung nationaler Instrumente, die Anreize für privatwirtschaftliche Investitionen im Klimaschutz liefern, hervorzuheben. Sobald die NMM-Gestaltung auf UN-Ebene beschlossen wurde, wird es wichtig sein, sowohl öffentliche Institutionen und als auch den privaten Sektor im Umsetzungsland fortzubilden, also wie man NMM implementiert und betreibt. Phase I könnte in einem ähnlichen Stil angewendet werden wie sie erfolgreich in der Europäischen Capacity Building Initiative (ECBI) durchgeführt wurde, d.h. durch informelle Diskussionen der politischen Entscheidungsträger, die einen vergleichsweise offenen Dialog ermöglichen und die auf Fachvorträgen basieren.

Wir empfehlen daher der Bundesregierung, z.B. drei Pilot-Umsetzungen des NMM auszuschreiben, bei denen Deutschland die generierten Kredite kaufen würde. Länder könnten z.B. als förderungsfähig für das Bieten definiert werden, wenn sie die dritte Phase der PMR erreicht haben. Um einen glaubwürdigen Anreiz zu erzeugen, sollte die Pilotphase über 4-5 Jahre (z.B. 2015-2020) laufen, und das Kreditvolumen sollte signifikant sein, also zum Beispiel 100 Millionen Tonnen CO_2e überschreiten. Andere Spender könnten finanziell dazu beitragen. Auswahlkriterien könnten die Angemessenheit des NMM-Konzeptes im Kontext des nationalen Minderungspotentials sein, die Bereitschaft zur Mitfinanzierung sowie die Existenz einer NMM-Strategie, die alle wichtigen Interessengruppen involviert und hierdurch Inhaberschaft illustriert. Darüber hinaus sollten die Minderungsanreize im Hinblick auf ihre potenzielle Wirksamkeit überprüft werden.

Pilotumsetzung

Die UNFCCC strebt an, in den kommenden Jahren Modalitäten und Verfahren für den NMM zu entwickeln. Pilotaktivitäten für den NMM sind wünschenswert, um über UNFCCC-Regeln zu informieren, sowie durchführende Länder davon zu überzeugen, dass der NMM ein attraktiver Kohlenstoffmarktmechanismus ist. Deshalb wird der deutschen Regierung empfohlen, sich an NMM-Pilotaktivitäten mit ausgewählten Partnerländern und eventuell gemeinsam mit anderen Industrieländern zu engagieren.

Mittels einer Checkliste, mit der die notwendigen Informationen auf eine formalisierte Art und Weise gesammelt wurden, konnte festgestellt werden, dass eine NMM-Pilotaktivität im peruanischen Wohnsektor umsetzbar wäre. Peru erfüllt die allgemeinen Teilnahmevoraussetzungen und hat sich aktiv dafür eingesetzt, Marktinstrumente im Bereich des Klimawandels durchzubringen, sowohl auf nationaler als auch internationaler Ebene.

Der institutionelle Rahmen ermöglicht einen relativ professionellen Umgang mit einer NMM-Pilotaktivität. Derzeit nehmen keine großen nationalen Initiativen diesen Sektor so ins Visier, wie das im Rahmen von NMM-Pilotaktivitäten erfolgen würde. Auf der anderen Seite gibt es ein starkes politisches Engagement zur Bekämpfung des Klimawandels und wie sich herausstellte, hat der Wohnsektor wesentlich zur Reduzierung der Treibhausgasemissionen in Peru beigetragen. MRV-Maßnahmen und Baseline-Definition sind allerdings für diesen Sektor ebenso wie die Projektion von Emissionsreduktionen unterentwickelt. Solide Berechnungen der Baseline und der Projektionen, sowie ein robustes MRV-System müssen entwickelt werden. Obwohl es offensichtlich ist, dass NMM-Pilotaktivitäten zu positiven Nebeneffekten führen können, benötigt Peru für eine erfolgreiche Umsetzung Unterstützung. Diese umfasst die Finanzierung, technische Hilfe und Kapazitätsaufbau, welche noch genauer definiert werden müssen.

Die Kurzbewertung von Peru macht offensichtlich, dass die derzeitigen Vorkehrungen zur Einbringung des Landes relativ leicht erreicht werden können, falls das Umsetzungsland den Marktmechanismen positiv gegenüber steht. Die Analyse zeigt aber auch, dass ein gewisser Grad an internationalen Anforderungen an Baselines und MRV nötig sind, um Umsetzungsländern Daten zu liefern, komplexe Studien zu betreiben und robuste Systeme einzurichten. Dies kann eine große Herausforderung für die NMM-Pilotumsetzung werden.

Fazit

Im Jahr 2010 vereinbarten die Vertragsparteien in Cancun die Etablierung marktbasierter Mechanismen, die weite Teile der Wirtschaft umfassen, bis zur nächsten COP in Durban zu erwägen. Dort wurde der NMM dann tatsächlich definiert. Außerdem vereinbaren die Vertragsparteien in Durban in 2012 ein Arbeitsprogramm durchzuführen, mit der Absicht Modalitäten und Verfahren für die Umsetzung des NMM zu entwickeln.

Im Laufe des Jahres 2012 war es allerdings nicht möglich, einen Entwurf für Modalitäten und Verfahren zu entwickeln, der bei der COP 18 in Doha angenommen werden konnte. Es stellte sich heraus, dass die Ansichten der Vertragsstaaten noch weit auseinander liegen. Einige Industrieländer, insbesondere die Vereinigten Staaten (USA), Japan und Neuseeland, lehnen die Ansätze der NMM-Umsetzung auf UNFCCC-Ebene ab und bevorzugen lieber einen reinen transparenzbasierten Ansatz (Rahmen für verschiedene Ansätze, FVA) ohne Prüfung durch Dritte, die zu Korrekturen führen könnte. Einige Entwicklungsländer, vor allem Brasilien, China und Indien, heben besonders den aktuellen Mangel an Nachfrage nach einem marktorientierten Ansatz hervor. Allgemein bevorzugen sie den koordinierten Ansatz der EU, aber sie würden ihn nur in Kraft setzen wollen, wenn die Verpflichtung zur Emissionsminderungen der Industrieländer erheblich erhöht wird. Einige andere Länder wie Papua-Neuguinea (PNG) stimmen weitgehend mit den EU-Vorschlag überein, bevorzugen aber den NMM auf Sektoren auszuweiten, wie z.B. Wälder, welche die EU zumindest derzeit nicht im NMM akzeptieren würde.

Vor diesem Hintergrund kann in Frage gestellt werden, ob bei den Verhandlungen im Vorfeld der COP 21 in Paris überhaupt eine Einigung über ein gemeinsames Verständnis des NMM erzielt werden kann. Wird das Ergebnis aus Durban wortwörtlich genommen, gemäß dem sich alle Vertragsparteien bis 2015 auf Verpflichtungen einigen sollen die alle Sektoren erfassen, dann kann auch in Frage gestellt werden, ob ein sektoraler Ansatz, dessen Konzepte aus der Zeit vor Kopenhagen stammen, für das künftige Regime nach 2020 einen zusätzlichen Wert bietet.

Anstatt zu versuchen, eine Einigung über marktbasierte Mechanismen für breite Segmente der Wirtschaft zu erzielen, sollten sich die Vertragsstaaten auf die allgemeinere Diskussion der Ad-hoc-Arbeitsgruppe der Durban Platform (ADP) konzentrieren und identifizieren, in welchem Umfang Flexibilität bei der Umsetzung wirtschaftsweiter Ziele im Rahmen der ADP notwendig ist und durch welche Maßnahmen diese Flexibilität erbracht werden kann.

1 Introduction

Der Klimawandel und die damit einhergehenden Auswirkungen durch die globale Erwärmung wurden als eine der größten Bedrohungen für unseren Planeten erkannt. Der 4. IPCC Report sowie viele andere Studien haben anschaulich dargestellt, dass die anthropogenen Treibhausgasemissionen drastisch gesenkt werden müssen, um eine hinsichtlich der Auswirkungen und möglichen Anpassungsmaßnahmen noch einigermaßen beherrschbare Entwicklung zu ermöglichen. Die notwendigen Minderungen liegen dabei in einer Größenordnung, die eine Einbindung von Reduktionsmaßnahmen in Schwellen- und Entwicklungsländern erfordert (IPCC 2007, S. 775-777). Dies gilt auch vor dem Hintergrund der dramatischen Wachstumsraten von Emissionen in diesen Ländern, welche jedoch die Chance auf einen nachhaltigen Entwicklungspfad hin zu einer kohlenstoffarmen Wirtschaft bieten.

In diesem Kontext haben sektorale Ansätze bei den Verhandlungen unter der Klimarahmenkonvention seit dem Bali Action Plan (1/CP.13) erheblich an Bedeutung gewonnen. Die Europäische Union verfolgt mit diesen Ansätzen insbesondere folgende Zielsetzungen:

- Beyond Offsetting: Sie haben das Potenzial, die globalen Anstrengungen zur Treibhausgasminderung auszuweiten und den Beitrag von Schwellen- und Entwicklungsländern sukzessive zu vergrößern.
- Reduktion von Transaktionskosten: Sie sind effizienter als die projektbasierte Ansätze, da nicht einzelne Projekt sondern gesamte Sektoren oder Subsektoren registriert, implementiert und überwacht werden müssen.
- Verringerung von Carbon Leakage: Sie werden darüber hinaus als Möglichkeit gesehen, Wettbewerbsverzerrungen und der Verlagerung von Emissionen in energieintensiven Sektoren, die in starkem internationalem Wettbewerb stehen, entgegenzuwirken.

Der Begriff der *sektoralen Ansätze* war noch 2009 recht weit und umfasste viele verschieden Ansätze (NAMA Crediting, Policy CDM, etc.). Inzwischen hat sich die Diskussion weiterentwickelt. Nunmehr werden vor allem zwei Ansätze differenziert (Raab et al. 2009):

- Sectoral Crediting: Grundlage ist die Vereinbarung von sogenannten *no-lose*-Zielen für bestimmte Sektoren oder Subsektoren einzelner Entwicklungsländer. Diese Emissionsziele sollen niedriger liegen als der *Business as usual*-Pfad, um einen eigenen Minderungsbeitrag dieser Länder zu gewährleisten. Wird dieses Ziel unterschritten, so können expost Minderungskredite ausgestellt werden, deren Erlöse auf dem globalen Kohlenstoffmarkt dann für die Refinanzierung der durchgeführten Minderungsmaßnahmen eingesetzt werden kann. Wird das vereinbarte Ziel nicht erreicht, so werden keine Minderungskredite ausgestellt (Schneider und Cames 2009).
- Sectoral Trading: Hierfür werden ebenfalls ambitionierte Minderungsziele für ausgewählte Sektoren einzelner Entwicklungsländer vereinbart. Allerdings müssen diese Ziele verbindlich sein. Wenn absehbar ist, dass das Ziel nicht erreicht wird, muss die Zielerreichung durch den Erwerb von Emissionsrechten oder Minderungskrediten sichergestellt werden. Vorteil dieses Ansatzes ist, dass die Emissionsrechte ex-ante zur Verfügung stehen und in den Entwicklungsländern direkt für die Integration nationaler Akteure in den globalen Kohlenstoffmarkt genutzt werden können.

Während Sectoral Crediting eher dem CDM gleicht, ist Sectoral Trading eher eine spezifische Form des internationalen Emissionshandels. Entscheidend für beide Ansätze ist, dass jeweils alle Anlagen oder Aktivitäten, die unter die Abgrenzung des jeweiligen Sektors fallen, erfasst werden und nicht nur einzelne Einheiten.

Bei den Verhandlungsrunden der Klimarahmenkonvention wird die Debatte um sektorale Ansätze inzwischen vor allem unter dem Tagesordnungspunk *BAP 1b(v) Various approaches, including opportunities for using markets, to enhance the cost effectivness of, and to promote, mitigation action* diskutiert. Diese Verhandlungen zu diesem Tagesordnungspunkt wurden in den Jahren 2011 und 2012 durch dieses F+E-Vorhaben wissenschaftlich vorbereitet, unterstützt und begleitet werden. Dabei wurden einerseits wesentliche Hintergrundinformationen zu den Ansätzen bereitgestellt, mögliche Ausgestaltungsoptionen für diese Ansätze entwickelt und konkrete Verhandlungspositionen für die Bundesregierung vorgeschlagen.

In den folgenden Abschnitten werden die Arbeitsergebnisse des F+E-Vorhabens dokumentiert.

2 Development of sectoral mechanisms in the UNFCCC negotiations

Work package 1, by Björn Dransfeld (perspectives), 13 May 2011

In the context of the climate negotiations under the UNFCCC the concept of sectoral mechanisms has gained momentum in recent years. These sector based market mechanisms are thought to address the abatement potential in sectors that so far has not been tapped. The 13th Conference of the Parties (COP) in Bali set the course for new market based mechanisms as potential elements of an international post-2012 climate policy regime. The Bali Action Plan called for the consideration of "various approaches, including opportunities for using markets, to enhance the cost-effectiveness, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries".

A main supporter of the creation of new market based mechanisms is the EU that developed and introduced the concept of sectoral crediting and sectoral trading in the UNFCCC negotiations in 2008. The omnipresent North-South split of the negotiations is also reflected with sectoral mechanisms: while in recent years sectoral mechanisms have received support from several industrialized countries, developing countries are rather sceptic when it comes to introducing new market based mechanisms.

Besides the EU, Parties such as Japan, Australia or New Zealand have backed the idea of sectoral abatement schemes. Also the US has been discussing the use of sectoral credits in the course of the congressional debate on the national climate and energy bill in 2009 and 2010. On the other hand, the BASIC countries and the G77 group generally argue that efforts at sectoral level could contribute to, but should not replace, legally-binding mitigation commitments by Annex I countries, which thus is regarded as conditional for the establishment of market mechanisms. They keep reiterating that in any case the majority of global mitigation action has to be borne through industrialised countries. Furthermore, the G77 stresses that domestic sectoral efforts for developing country Parties were just one option in the toolbox for national mitigation actions. But the main concern of developing countries with market based mechanisms is certainly the suspicion that their introduction leads to the imposition of firm mitigation targets. Nevertheless, several smaller countries such as Costa Rica, Colombia or Korea have been supportive for sectoral crediting.

Developing countries moreover fear the introduction of trade barriers and thus oppose benchmarks or standards for their domestic markets. The Latin American countries Bolivia and Venezuela have established themselves as hardliner opposition of any market based attempts. Although these countries are often referred to as ALBA group, they do not necessarily represent all Parties of the classical ALBA group (such as Ecuador, Nicaragua or Caribbean states).

While COP15 in Copenhagen in December 2009 was not able to make a decisions on the introduction of new market based mechanisms, the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) 8 generated a draft on several items in Copenhagen, such as item 1b (v) of the Bali Action Plan on "various approaches, including opportunities for using markets, to enhance the cost-effectiveness of, and to promote, mitigation actions". In the draft of the AWG-LCA decision on item 1b (v), several Parties (i.a. EU, Umbrella Group, Korea, Columbia) proposed an option to the COP, in which they request the Subsidiary Body for

Scientific and Technological Advice (SBSTA) to compile definitions, modalities and procedures for new market based mechanisms.

In the course of 2010 the climate talks held in April, June, August and October were thought to fine-tune the draft AWG LCA decision on mechanisms. Though, over the year strong particular interests led to a heavily riddled AWG LCA text with many options and brackets. Hence, the AWG KP did not refer to sectoral trading or crediting mechanisms in its text that evolved over the year.

2.1 Current debate on sectoral mechanisms – party submissions

The COP16 in Cancun nonetheless decided to consider the establishment of market based mechanisms at the next COP17 in Durban 2011. These shall base on the principles of voluntary participation, cover “broad segments of the economy” (sectors), ensure the environmental integrity and lead to a net decrease of GHG emissions. In addition, they shall be complementary to NAMAs, supplemental to domestic efforts in industrialised countries and have a robust market design as well as sound regulative rules.

COP16 made clear that any new market mechanism shall co-exist with existing mechanisms under the Kyoto Protocol. The AWG LCA has been requested to draft a decision for COP17. In this regard, parties were invited to submit their views and position on the establishment of one or more market based mechanisms by the end of February 2011 in order to discuss them at the sessions in April and June. Besides this there were other calls for submissions, for instance on non-market based mechanisms and the evaluation of the existing mechanisms under the Kyoto Protocol.

22 parties submitted inputs on market based mechanisms prior to the AWG LCA intersessional meeting in early April (FCCC 2011a). Parties now seem to sense the need to enter into detailed discussions and thus do propose a comprehensive scope of issues. The submissions serve as the basis for negotiations under the AWG LCA in April and June 2011. In general, the submissions are perceived as rather constructive. The inputs on market mechanisms comprise a broad range of topics from supportive to opposing, from continuation of existing mechanisms to replacement of existing through new mechanisms and from project based over policy or sectoral approaches to NAMA crediting.

Interestingly, of the BASIC countries only China submitted input. However, since the BASIC group governments met in early March 2011 in Delhi, India to align their climate policy strategies on the run up to Durban, it is understood that China´s submission in general represents the BASIC views. Also, South Africa, that has been supportive for installing a NAMA crediting mechanism in the past, may take a neutral approach this year as it hosts the upcoming COP17 and is eager to facilitate the negotiations in an inclusive and constructive manner. Besides this it is noteworthy that the United States of America has not submitted any contributions to the debate.

Subsequently, the most relevant inputs with regards to the design of (sectoral) market based mechanisms are reflected.[1]

Market based mechanisms are still opposed by Bolivia and Venezuela. Malaysia[2] (host to several CDM projects) raises the issue that low cost abatement options in developing countries have been addressed through industrialised countries via market mechanisms, leaving only expensive abatement options for domestic action through the host country. Bangladesh and Tuvalu, amongst others, underline that new mechanisms require a sound design avoiding market failure. Broad support for market mechanisms comes from the EU, AOSIS, Australia, Colombia, Ecuador, Japan, NZ, Norway, Papua New Guinea, Peru, South Korea, Singapore, Switzerland, Turkey and Russia. Even Saudi Arabia, that so far has not shown a constructive behaviour in the debate on market based mechanisms, has submitted a rather progressive position. China generally sees the establishment of new mechanisms as feasible, under the condition that the US commits to firm reductions. In addition, several parties do implicitly support the creation of sectoral mechanisms, amongst which are the EU, Japan, Norway, Russia[3], Switzerland, Colombia and AOSIS (via Grenada). Sectoral mechanisms thus currently hold a prominent position for the upcoming negotiations under the AWG LCA, although they are one tool amongst several market mechanisms such as NAMA crediting or the CDM.

Content wise the majority of the submissions focus on general aspects of new market mechanisms and do not formulate specific design aspects for sectoral mechanisms. Thus the subsequent Table 1 in the first place displays issues true not only for sectoral mechanisms but for all market based mechanisms, followed by few sector specific aspects and miscellaneous topics.

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1 For a general discussion of the submissions see the respective chapters in the report of the UBA project "Market Mechanisms in the design of the post-2012 climate regime" (FKZ: 3710 41 133).

2 Malaysia submitted its view within the submission on the evaluation of market mechanisms (FCCC 2011b).

3 Russia submitted its view within the submission on the evaluation of market mechanisms (FCCC 2011b).

Table 1: Submissions on new market mechanisms parties – summary by topic

Issues related to new market based mechanisms	
General issues	- All countries except Bolivia and Venezuela highlight that market mechanisms should complement the existing Kyoto Mechanisms. - Japan and Australia request the consistency of co-existing frameworks and mechanisms - in this regard, the avoidance of double counting is stressed by several parties. - Papua New Guinea and Australia favour the adoption of an overarching framework, under which then countries can choose to apply specific measures and mechanisms according to the requirements of their domestic environment (so called “menu concept”). - Parties consider any actions for developing countries as voluntary. However, AOSIS mentions that targets for developing countries can be binding. - New market mechanisms should contribute to global net reductions, which is highlighted by AOSIS, Colombia, EU, Norway and Switzerland.
Governance	- A centralized governance approach is proposed for instance by Australia, the EU, Saudi Arabia, AOSIS or Papua New Guinea. Under this scenario a global framework would be set up, under which then guiding principles or eligibility criteria are established (such as for JI Track 1).[4] - A decentralized governance system would establish action based assessment of reductions such under the existing CDM and is supported by Japan and the EU, as well. - The majority of the submissions (including the EU) underscores that any mitigation action needs to be shaped according to the domestic environment based on principle of subsidiarity. - It is more or less common sense that an international actor should be installed, a role that many parties see with the UNFCCC.

4 AOSIS has already drafted potential criteria that could be applied, such as the installation of a target below business as usual, the setup of a national GHG evaluation system, the existence of historic emission data of the respective sector (gathered by using IPCC methodologies), an objective review of baselines and projections through sectoral experts, the frequent reporting of national and sectoral emissions, maintenance of issued units in a registry or procedures to avoid double counting. Criteria for Annex 1 countries could be the same as already existing under the Kyoto Protocol.

Scope of market mechanisms	- While new market mechanisms in general follow the idea to broaden the scope of a project based system, China and Saudi Arabia propose to limit new mechanisms to a project based approach. - With respect to the potential boundary of a system subsectors, sectors or multisectors are suggested. - Japan and Papua New Guinea want all technologies to be eligible (i.e. including CCS and nuclear power), while AOSIS wants to exclude industrial gases. Bolivia wants to ban CCS and industrial gases from any mechanism. - Saudi Arabia has proposed a positive list for international project types eligible under a mechanism.
Supplementarity	- Domestic reductions through Annex-1 countries are essential for almost all developing countries. China even sees binding targets of parties outside the Kyoto Protocol as a precondition for acceptance of market based mechanisms, a clear broadside against the USA. - Bangladesh wants to limit use of offsets to 20 %, while Saudi Arabia wants host countries to receive a share of the credits originated through domestic action.
Fungibility	- Many countries highlight the importance of fungibility of credits. - In particular Japan wants new market mechanisms to be fungible with bilateral mechanisms.
Environmental integrity	- Common rules for baselines and MRV are proposed for instance by Norway, Japan and AOSIS. Russia suggests a harmonized approach for setting targets. - Parties are all highlighting the necessity of environmental integrity of future schemes. The most important issues in this regard are avoiding double counting and leakage, ensuring the additionality of credits, ensuring that offsets address mitigation actions with higher abatement costs ("higher hanging fruits"). - Norway in addition mentions establishing an international registry, while Korea proposes the use of indirect MRV through default values (such as the penetration of energy efficient appliances). - China underlines that offsets may not be regarded as financial contributions by industrialised countries.
Capacity building	- Almost all parties highlight the importance of capacity building in order to allow developing countries to set up the required infrastructure for a new mechanism. Thus, there are clear expectations that capacity building is borne and conducted by industrialised countries.

Issues directly related to sectoral mechanisms	
	- On the scope of sectoral mechanisms, AOSIS and Russia suggested the power, steel and iron and cement sector, AOSIS as well the transport for initial consideration. - On sectoral trading, AOSIS has suggested the definition of an "inscribed amount", which would be the recognition of voluntary developing country pledges under the Convention (such as Annex B). Basically this trading system would comprise an ex ante allocation of "Inscribed Amount Units" (IAUs) and an ex post "duty" to surrender. Parties would then be able to trade. - AOSIS furthermore calls for a technical paper to scope the potential in key sectors in developing countries.
Miscellaneous	
	- Colombia has proposed a "Mechanism for Carbon-Efficient Economies (MCEE)" that is essentially a discounting approach with a sectoral and sub-sectoral scope. Discount factors range from 2 – 41%, depending on the countries share of global emissions. Further 2% are proposed for the adaptation fund share of proceeds. - Papua New Guinea suggests establishing a Sustainable Market Mechanism Standard Board and a Carbon Reserve Bank. While the former is understood as a regulator for a new market mechanism (such as the EB under the CDM), the latter is thought to work similar to the IMF – in case of certain sectors underperformance the Bank would step in providing credits in order to fill the gap of credits. However, this aid is suggested to be conditional to the adoption of certain rules through the host country. It is very unlikely that developing countries would agree to such an attempt that undermines their national sovereignty. - Ecuador has outlined its approach for the market based treatment of net avoided emissions in the Yasuni national park. Essentially the country wants to be rewarded for not exploiting the oil from the fields under the tropical rainforest reserve. - AOSIS highlights that mechanisms for aviation and shipping that potentially evolve under the ICAO and IATA regime should be regarded and checked for potential linkage to the UNFCCC system.

2.2 References

FCCC 2011a: Submissions from Parties on Market-based and non-market-based mechanisms. Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Fourteenth session, Bangkok, 5–8 April 2011, and Bonn, 6–17 June 2011, Item 10 of the provisional agenda (AWGLCA/2011/MISC.2), Bonn, http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf

FCCC 2011b: Submissions from Parties on the evaluation of various approaches in enhancing the cost-effectiveness of, and promoting, mitigation actions. Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Fourteenth session, Bangkok, 5–8 April 2011, and Bonn, 6–17 June 2011, Item 10 of the provisional agenda (AWGLCA/2011/MISC.4), Bonn, http://unfccc.int/resource/docs/2011/awglca14/eng/misc04.pdf

3 Incentives for mitigation investments

Work package 2, by Björn Dransfeld, Axel Michaelowa (perspectives), Martin Cames, Sean Healy (Öko-Institut), 29 June 2011

The basic idea for sectoral mechanisms has been introduced mainly for two entirely different reasons:

- On the one hand they should provide a bridge for the transition towards a global carbon market and for the transition from a non-Annex I to an Annex I country (Schmidt et al. 2006).
- On the other hand they should overcome the flaws of project-based mechanisms such as 1) high transaction costs due to necessary registration, monitoring and verification procedures, 2) lack of environmental integrity due to a high risk of carbon leakage and/or inflated baselines and 3) limitations in the mitigation potentials which could be addressed by them (closure of activities without replacement at the same site; etc.).

The transition from a non-Annex I to an Annex I country would require substantial changes within a country since the entire economy would be subject to an absolute greenhouse gas (GHG)emission cap. The sectoral mechanism has been suggested as an intermediate step towards the integration of all countries into one global carbon market. Non-Annex I countries would have the opportunity to identify certain sectors of their economy which would already be included into the global carbon market while the rest of the economy would still be "unaffected". Over the time, the coverage of sectors could be gradually increased with the aim to finally include the entire economy into the global carbon market.

At the same time, sectoral mechanism could address the flaws of the project-based mechanisms, since they would enable to streamline many procedural issues. The environmental integrity could at the same time be increased since, generally speaking, the risk of leakage is the smaller the larger the scope of a mechanism and if sectoral thresholds would be ambitiously below BAU to avoid inflated thresholds and reflect own contributions by developing countries.

However, establishing of sectoral mechanisms would also change the role of emitters (e.g. private entities) and of the government. Under project-based mechanisms the host government has mainly a supervising role and may encourage the establishment of projects though the economic responsibility remains with the project developer or project owner. Under a sectoral mechanism, the host country government would have a more active role and would have to ensure that the emission reductions are actually achieved because otherwise no revenues to cover additional cost for GHG mitigation measures would be achieved. Sectoral mechanisms currently are distinguished into sectoral trading and sectoral crediting.

A sectoral trading mechanism implies an absolute commitment to reduce GHG emissions of a certain sector for the host country. "Absolute" implies that in case of non-compliance with the target sanctions will apply to the host country. An amount of allowances corresponding to the target will be allocated to the country ex-ante. Given the binding nature of this mechanism, the government will very likely pass the responsibility onto the sectoral emitters, either by setting up an emissions trading scheme or by imposing mandatory measures.

Besides this "must comply" option under sectoral trading, the sectoral crediting mechanisms offers a "can comply" option. Under a crediting mechanism, a country agrees to a reduction target as well, which rather corresponds with a business as usual scenario and has no binding character (no lose target). In case of compliance with the target, the emission reductions beyond the target will be credited ex-post. In case of non-compliance, no sanctions apply. Credits will be tradable on the international carbon market and hence provide international finance for mitigation. The idea is, that the host country initially contributes to mitigation through domestic measures (essentially the ones with the lowest abatement costs, so called "low hanging fruits") but can obtain international carbon finance for activities that address reductions beyond the business as usual scenario (so called "higher hanging fruits"). However, the incentive for the government to meet or even over-achieve the target is clearly weaker as under a trading mechanism with a mandatory goal.

On this background this paper scrutinises whether the shift in responsibility from emitters or investors to host country government would limit or even eliminate emitters' incentives to engage in seeking cost-effective mitigation options and if so, by which means such outcome could be avoided or limited to the extent possible. It shall be noted here, that emitters may be of different legal nature – public, public-private or solely private nature. It is though assumed that the strongest incentives in this respect are required for private entities, hence this paper concentrates on the private sector.

In the next chapter we describe in detail the issue which may be caused by the different responsibility structure under a sectoral mechanism. Based on these deliberations we discuss to which extent potential instruments and measures can provide the required incentive to seek for cost effective greenhouse gas mitigation options (chapter 3.2). We complement these considerations with a summary of views of selected actors on this issue (chapter 3.3) and with a synopsis of experiences gained so far (chapter 3.4). Finally we draw conclusions and derive implications for the concept of sectoral mechanisms (chapter 3.5).

3.1 Description of the issue

3.1.1 Differences to project-based mechanisms

Sectoral mechanisms are in many aspects fundamentally different to project-based mechanism. However, two aspects are centrals with regard to the incentive structure of those mechanisms: Sectoral mechanisms

- cover all activities or installations within a certain sector boundary and
- require governments to play a different role.

Under a project-based mechanism, only selected activities or installations will be subject to mitigation measures. Under a sectoral mechanism, in contrast, all installations within an ex-ante determined sector boundary will be covered. This shift will increase the mitigation potential which can be addressed, enhance the portfolio of technical mitigations measures which can be taken, specifically if the sector boundary is wide and includes various activity types, increase environmental integrity by reducing the risk of leakage since output cannot be transferred to uncovered activities and reduce transaction costs because a number of requirements under a project-based approach such as registration and determination of a baseline only have to be done once for the whole sector but not per project activity. Mitigation measures will most likely only be initiated at those activities with the worst emission performance even though all activities within the boundary will be covered by the mechanism. Sectoral mechanisms will also enable a transition to advanced or integrated mitigation technologies if the sector boundaries are defined adequately.

In addition, the economic responsibility would be shifted from the project owner or project developer to the host country government. Currently, governments only need to approve during the registration process that a planned mitigation project complies with their sustainability criteria but do not face any responsibility if the project does not generate the revenues which are required to recover the mitigation costs. The economic risk of a mitigation project is exclusively borne by the project owner.

Under a sectoral mechanism, private entities cannot take the responsibility for an entire sector which includes all activities. Therefore, the host country government needs to take that responsibility and needs to ensure that the envisaged greenhouse gas mitigation is actually achieved. In this regard sectoral mechanisms are much closer to international emissions trading pursuant to Article 17 of the Kyoto Protocol which entitles Parties to trade emission allowances among them. Governments are not required but may directly involve emitting entities in trading of internationally recognised emission allowances.

The same would apply to sectoral mechanisms. Host country governments would, possibly after consultations with business representatives of the covered sectors, submit a proposal for the implementation of a sectoral mechanism. This proposal would include a clear definition of the sector(s), business as usual projections as sectoral threshold, a target (absolute or no lose) including own contributions and a detailed descriptions how the target should be achieved. After approval of the proposal, the host country government needs to ensure that the projected greenhouse gas reductions are achieved. As with international emissions trading, the government will trade excess allowances or generated reduction credits to cover the cost of incentives for the covered activities or installations in their country (chapter 3.2).

3.1.2 Challenges for private investors under a sectoral mechanism

While any sectoral mechanism aims to trigger investments into mitigation activities, a crucial question is how these investments are going to be incentivized. The willingness of investors to invest into certain activities depends on several parameters, such as the mechanism applied (trading or crediting), the detailed layout of the scheme or country and sector specific parameters.

According to the concept of sectoral mechanisms, the host country government agrees on a absolute or voluntary (aka no lose) target for a certain domestic sector. Based on the economic theory underlying these market based instruments, as well as the principle of subsidiary, the government is free to choose the most appropriate and economic means to keep the emissions below the targets.

In order to do so, a domestic framework that urges the emitters of the respective sector to act in line with the governmental specifications has to be set up. Key parameters for successful implementing any sectoral mitigation attempt thus are (i) the design of the policy framework,

(ii) the ability of the government to implement or even enforce action under this framework and (iii) the sectoral emitters that have to reduce emissions.

The design of the policy framework determines instruments and measures that can or must be applied to achieve respective reductions and specifies rules and procedures for the application of these measures, for instance on responsibilities of actors, MRV or a sanctioning regime. Those potential measures will differ depending on whether a sectoral trading or a sectoral crediting mechanism is installed and depending on the nature of the target (absolute/no lose).

The ability of a government to implement sectoral mitigation action under the policy framework is certainly dependent on many factors, such as the form of governance or the government's capability to assert its positions against lobby groups. De-facto dictatorship governments may find it easier to enforce action, while democracies strive to adopt rather balanced, consensus orientated solutions. The latter for instance applies to the voluntary commitment of the German industry to reduce emissions, a political compromise that actually failed.

Moreover, the success of any policy will be influenced by the legal character of emitters that can be state owned companies, public-private entities or private businesses (either purely domestic or JVs with foreign shareholders). In the first place, the different forms of entities follow different intrinsic motivation to act and will do this in a more or less economic manner. While public actors tend to operate inefficiently, private companies are first of all profit maximizing entities and thus required to manage their resources efficiently. Second, governments may simply decide that public actors apply certain mitigation measures, whereas private emitters will usually require specific incentives to act in any way other than the most profitable one.

Thus the question, whether a shift of responsibilities towards the governmental level would limit or eliminate incentives for investments, is most relevant for the specific scenario of a sector that is predominantly characterized by private entities and has been featured with a sectoral no lose crediting mechanism. Whether the following hypothetical challenges and their potential solutions actually apply or not will be discussed further below:

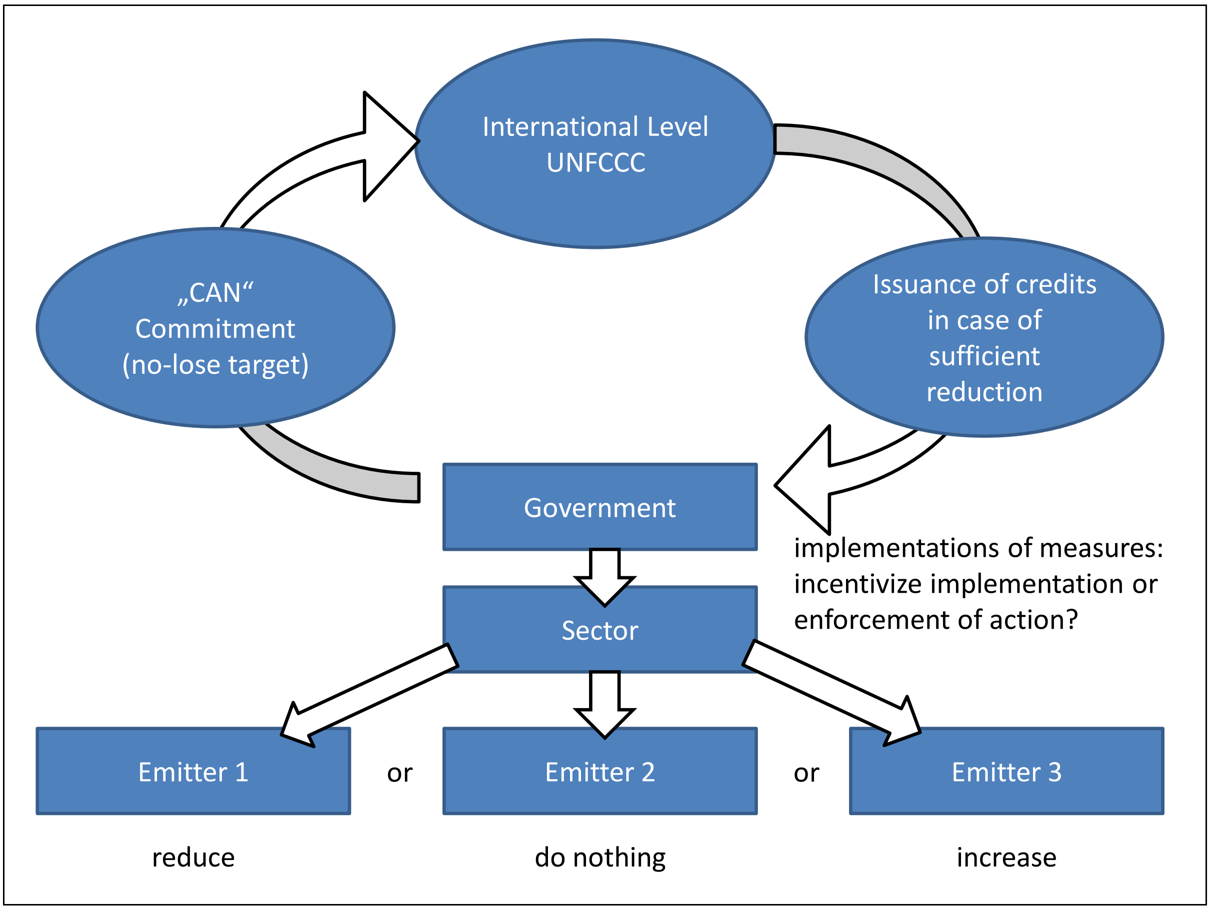
- **Principal-Agent dilemma**: Emission reductions are caused by action at the sector level, thus under this set up any action to reduce emissions requires investments by private entities. However, the overarching incentive to reduce emissions is provided by credits that will be issued by an international body, such as the UNFCCC, and be transferred ex-post to the host country government. Only if the government would directly forward the credits or an equivalent of the investment to the investor, this would ensure mitigation through the emitters.

- **Free Riding and sectoral underperformance**: The entire sector (i.e. aggregated emissions) has to comply with a no lose target. If the entire sector misses the no lose target, no sanctions will apply. If the entire sector meets or over-achieves the target, credits will be issued. For a single emitter the question arises, whether all of his competitors will reduce, do nothing or even increase their emissions. The character of the no lose target triggers the do nothing option, i.e. "free riding behaviour", since a missing of the target implies no sanctions and uncertainty over the activities of competitors prevails.

- **Lacking Guarantees**: Besides the costs of opportunity that come along this delayed payback, investors face a lack of guarantees that they actually receive an equivalent to their investment in case of underperformance. This is in particular true for foreign investors from Annex 1 countries. Unlike the Clean Development Mechanism (CDM), a new mechanism lacks experiences and credibility and investors thus will act rather cautiously.

- **Ex-ante investments/ex-post credits**: Investments to bring down the sectors emissions are required prior to the start of a crediting period. But only once the sectoral abatement has been conducted, monitored at installation level and verified, credits can be issued.

Figure 1: Implementation of sectoral measures under a sectoral crediting mechanism



Similarly to other baseline and credit schemes such as the CDM, private entities initially lack incentives and guarantees to invest in emission reduction technology. In order to overcome these challenges, the government could either impose mandatory measures to stay at least within the business as usual scenario or could provide incentives and guarantees for emitters to implement the respective mitigation actions.

3.1.3 Role of actors

As described above, sectoral mechanisms were, among other reasons, suggested to provide an intermediate step within the transition towards a global carbon market which would finally include all countries. Quite evidently, governments, in particular host country governments, need to take a different role with more responsibilities under such an approach.

Different to project-based mechanisms, where project owners or project developers, i.e. private entities, develop and implement a project, under sectoral mechanisms the host country government would have the leading role in establishing such sectoral mitigation effort in their country. They would develop a proposal for the implementation of a sectoral mitigation effort which would include

- a clear definition of the sector boundary including an enumeration of activities which would be not covered,
- a business as usual projection which will be used to determine the level of ambition,
- an absolute or a no lose target over a clear time frame (5, 10, 15 years, etc.) which includes a certain degree of own contributions,
- a detailed description of how the necessary mitigation measures are incentivised,
- a projection of the impact of these incentives on the sectoral greenhouse gas emissions and
- a reliable sectoral monitoring plan.

After review by a supervising entity (e.g. UNFCCC), the proposal would be approved and could then be implemented by the government.

In the case of an absolute target (sectoral trading), the host country government would receive allowances corresponding to their target. At the end of the timeframe or after ex-ante agreed periods, the host country government needs to submit a sectoral inventory and to surrender the corresponding amount of allowances. The excess allowances, whose amount can be estimated from the difference between the threshold and the projected impact of sectoral incentives, can be sold on the global carbon market to recover the financial resources which are needed to provide the sectoral mitigation incentives. However, the host country government would have to purchase additional allowances if it finally turns out that the actual emissions are higher than the remaining allowances.

Provided that the units established under a sectoral mechanism are fully fungible with allowances under international emissions trading, the host country government could trade these sectoral allowances with all Parties participating in international or sectoral emissions trading. In addition the host country government could also trade these allowances with private entities of those countries where the governments provide for such direct involvement of the private sector.

With a no lose target (sectoral crediting), credits can only be issued if the promised reductions are actually achieved and verified. Formally the host country government can thus participate in trading efforts only after credits have been issued. However, host country governments could try to establish agreements similar to the so called emission reduction purchase agreements (ERPAs) under the CDM. Under such an agreement the host country government and countries or private entities which need to purchase credits would ex-ante agree to trade credits at a certain price once they are issued. These agreements often include upfront payments by the purchasers which result in a respective rebate on the agreed credits price. That way, the host country government can also mobilise upfront financial resources to recover parts of the costs of those incentives or measures which are planned to achieve the promised emission reduction in their countries sector.

Private entities within the host country can either be involved directly, indirectly or not at all into the global carbon market. It is at the host country's discretion how to provide incentives to private entities (chapter 3.2). Whichever option is selected, important is that the planned emission reduction is finally achieved. Otherwise no credits can be issued whose revenues could be used to recover the cost of incentives or measures. And even worse, if the host country would have agreed to a sectoral ERPA, they might even be forced to pay for non-delivery of sectoral credits unless such non-delivery risks are not covered by respective insurances.

Obviously, host country governments would have strong interests to ensure that the targets of a sectoral agreement are in fact achieved. Therefore they would need to establish effective regulation which provides sufficient incentives to the private entities in their country to reduce greenhouse gas emissions and they would have to enforce that regulation adequately.

In this regard, free riding would only occur if the host country government would also provide financial incentives to those activities or installations which do not reduce their emissions. However, this would be quite illogic and such provisions should already be identified and corrected during the review process because it certainly would result in a failure of the proposed agreement.

In contrast, host country governments need to guarantee the financial incentives for each tonne actually reduced also if the agreed sectoral target would not be met. Host country governments will therefore propose sectoral agreements which certainly can be met because the economically attractive potential is larger. Private investors will scrutinise the publically available proposal documents for sectoral agreements and will assess whether the targets of the suggested agreement can realistically be achieved or not. If they basically agree with the proposal, they will check whether investing in greenhouse gas emission reductions will be economically attractive or not.

However, the host country's government may change during the economic lifetime of mitigation measures and the new government may withdraw the incentive. This would certainly result in distrust against the new government and the country in general and this distrust would most likely not be limited to mitigation investments but affect any foreign investment. Such regulatory risk can therefore not be entirely denied but seems to be small because it would cause consequences not just for mitigation investments but for the entire host country economy.

Emitters in the covered sectors would at least to that extent be involved that they need to decide whether the provided incentive would make any mitigation measures economically viable. If that is the case they may implement such measures themselves or task project developers with the implementation of such measures.

Greenfield projects such as renewable energy projects may be implemented by emitters or by project developers with specific experience in the respective field. The extent to which project developers will be involved may depend on how the incentives to reduce emissions are provided to the covered sectors. Direct involvement in the (global) carbon market may attract more project developers than emission performance standards (chapter 3.2).

3.2 Incentives: instruments and measures

Incentives can be maintained for private companies through several options described below. The discussion assumes that the sectoral target can be allocated to emitting installations in form of an installation-specific baseline; this target level will be called "baseline level". The first section of this chapter discusses incentives directly related to the emissions credits, the second part policy instruments that serve as an incentive to mitigate and thus indirectly create emissions credits.

3.2.1 Guaranteed sectoral credit revenues

A host country government could guarantee each company that reduces emissions below the threshold level to receive internationally tradable credits as per the reductions achieved and monitored. This would expose the government to the risk to have to import Certified Emissions Reductions (CERs) or Emission Reduction Units (ERUs) to cover the shortfall caused by companies emitting above the threshold level. The government could reduce the risk by introducing policy instruments that penalize emissions above the threshold level (see 3.2.7 and 3.2.8 below).

3.2.2 Carbon funds with shared risks

All private companies in the sector would be organized in form of a carbon fund that pays dividends to its shareholders pro rata to the achieved and monetized reduction credits. While this approach would reduce the government-related risk, it cannot address the free riding problem, unless the management of the carbon fund would be able to introduce policy instruments that penalize emissions above the threshold level.

3.2.3 Revenue split

A contract between the private companies and the government would specify a revenue split from the emission credit sales. The government could retain a portion (2-5%) to cover the costs for administration of the scheme, whereas the rest would be allocated proportionally to the reductions achieved. This approach would have the same free riding problems as the one described in 3.2.2.

3.2.4 Domestic mandatory emissions trading scheme

Under a mandatory emissions trading scheme (ETS), there would be a clear incentive to reduce emissions as those companies with a lack of allowances would need to acquire allowances to cover their shortfall. The system could be designed as follows: The overall cap of the scheme could be set at the level of the threshold. This would ensure that the crediting threshold is exactly met. The host country could then allow entities in the sector to exchange national emission allowances against futures of sectoral credits. The exchanged national emission allowances would need to be surrendered in a national cancellation account and could hence not be used on the national market anymore. This would ensure that each exchanged allowance results in an emission reduction below the crediting threshold (Schneider & Cames 2009). To prevent that the domestic carbon price exceeds the price of the global carbon market if it turns out that too many domestic allowances have been exchanged, the host country government should also accept internationally recognised units for compliance under the notional trading system. Covered entities would have an incentive to exchange domestic allowances against sectoral credits as long as the price of credits is higher than the price of allowances. Such a mechanism would interlink the national GHG emissions trading schemes with the global carbon market. Host country governments may see this approach as the first step on the slippery slope towards legally binding commitments and thus be reluctant to accept it.

3.2.5 Tradable intensity standard

As many developing countries fear an approach based on absolute emissions, Whitesell and Helme (2009) have proposed a tradable intensity standard. The host country government would set an intensity standard in from of a domestic benchmark which is equal to the threshold level for the sector.[5] Installations which beat the benchmark, would receive an internationally recognised credit for each tonne below the benchmark from the host country government. Firms whose emissions exceed the benchmark would have to purchase internationally recognised credits from domestic installations which beat the benchmark or on the global carbon market. For each tonne below the threshold the host country government would receive an internationally recognised sectoral credit from the respective issuing body. In addition, the host country government would receive compliance credits from installations which exceed the benchmark. Both amounts together would be exactly equivalent to the amount which is required to reward the installations whose emissions are below the benchmark.

3.2.6 Feed in tariffs and subsidies

If a sectoral mechanism is introduced in the electricity sector, the government could introduce a feed-in tariff for renewable electricity. If the tariff is sufficiently high to make renewables commercially attractive, the increasing renewable electricity production will generate sectoral credits. These credits will accrue to the government and could cover part of the cost of the feed-in tariff. The disadvantage of this approach is that the incentive due to the feed-in tariff depends on the credibility of the government which has to sustain the tariff for a substantial time period.

Subsidies could be granted for many sectors and technology types, especially when it comes to energy efficiency improvements (procurement programmes, scrapping schemes for old devices, etc.). The challenge with subsidies is to avoid that they “fossilise” over time and support inefficient abatement options.

3.2.7 Taxes and subsidy reductions

There are different ways to use taxes as an incentive for sectoral crediting. A win-win approach for the national economy would be the reduction of fossil fuel subsidies accruing to the companies covered by the sector. The reduction of the subsidies would trigger emission reductions and the accrual of sectoral credits to companies reducing emissions would at least partially offset the monetary losses of the companies.

The simplest way of taxation would be to tax revenues from sales of sectoral credits that could be reinvested to buy international credits to cover emissions increases from some companies.

5 This may require some unit conversion if the baseline level is not defined in form of a benchmark.

From an incentive point of view, such an approach would be highly problematic as it reduces the incentives for reduction and actually encourages free riding.

A much more incentive-compatible way of taxation would be an emissions tax for emissions above the threshold. As a disadvantage, this approach would require determining baseline emissions at installation level which may result in high transaction costs and trigger lobbying activities. Proceeds from this tax could be used by the government to buy emissions credits to cover the shortfall due to the excess emissions; ideally the tax thus would be set at a level equal to the market price for international credits. Due to the variability of these prices, the tax level should probably be set higher to avoid frequent changes.

The host country government could also tax fossil fuel use entirely to incentivise energy efficiency and make renewable fuels commercially attractive. The tax level would have to be set at a level sufficiently high to lead to an emission reduction below the threshold. If the introduction of the tax increases the awareness of energy efficiency improvements, the tax level could remain quite low and still harness a significant amount of sectoral credits that should accrue to the companies directly. The government could then redistribute the revenue from the tax in a way that does not disincentivise further emission reductions.

All tax-related options require good governance and a will provide mitigation incentives if the companies believe in the governments ability to implement and enforce such policies.

3.2.8 Standards and regulation

A mandatory requirement to install emissions mitigation equipment to reach the threshold could be coupled with a direct allocation of credits to the companies that reduce emissions below the baseline. The host country government guarantees to buy international credits to cover emissions of companies with excess emissions. This approach requires willingness of developing countries to enforce the abatement mandates. Governments might slap penalties on installations that do not comply with the mandate and use the revenues to buy credits to cover the shortfall.

3.2.9 Result

In order to provide sufficient mitigation incentives for private investors, the host country government would have to introduce policy instruments such as a mandatory regulation sufficient to achieve the threshold or a tax for excess emissions or a combination of several instruments, because then emissions reductions will not be "eaten up" by emissions remaining above the target level. The credibility of such an approach rests on the trustworthiness of the government to enforce a regulation or to collect a surplus emissions tax. Such policy combinations would allow the government to directly collect the funding for acquisition of international credits to reach the sectoral target level.

3.3 Views of selected actors

Baron, Buchner & Ellis (2009, pp. 23-28) discuss how sectoral crediting can be implemented at the host country and how emitters and other actors can be incentivized to invest in mitigation technology. They discuss options "ranging from a separation from the price signal (credit revenues go to the government) to an attempt at a full link (with full liability assumed by the government in case of overselling)" (Baron, Buchner & Ellis 2009, p. 27). They conclude that for "some of the implementation options ..., the government would also have more liability compared to the CDM" (Baron, Buchner & Ellis 2009, p. 28) and found "that the carbon market incentive to individual investors in mitigation may be less direct, and therefore weaker than that under a single project configuration like the CDM" (Baron, Buchner & Ellis 2009, p. 6). Despite the fact that the implementation of sectoral agreements requires a significant policy effort on the part of the host country government, they agree that incentives for private entities can basically be established.

Whitesell and Helme (2009) analyse various approaches how the price signal of the global carbon market can be fully passed through to the entities covered by a sectoral agreements. They discuss "Sector Programs and NAMAs", "Cap-and-Trade in Developing Countries", "No lose Sector Crediting" and "Tradable Intensity Standards" and find that in each of the approaches mitigation incentives can be established which are more or less directly linked to the global carbon markets. Cap-and-trade and a tradable intensity standard (section 3.2.5) may however provide the most direct incentives since they would be based on internationally recognised units and do not require the establishment of national units.

IETA (2010) also scrutinises how private sector entities could be incentivized to establish greenhouse gas mitigation measures under sectoral mechanisms. They analyse three options, "Central Coordination of Mitigation and Crediting", "Domestic Sectoral Emissions Trading System" and "Installation-Level Mitigation and Crediting" with respect to their abilities to provide such incentives to the private sector and conclude that certain design options "would entail risks to investment that could severely curtail the ability of private finance to play a significant role," but "that various options also exist that could incentivize scale up, achieve mitigation objectives, and still meet the needs of private investors" (IETA 2010, p. 15).

For developed or developing country Parties incentives for the private sector do not seem to be an issue at all. Earlier this year, 22 Parties submitted their views on new marked-based mechanism including sectoral mechanisms.[6] Many highlighted that markets in general provide incentives for the innovation and diffusion of low carbon technologies but only Papua New Guinea touches on the issue of incentives for the private sector. However, even Papua New Guinea does not put into questions that incentives for the private sector can be maintained but calls only for an implementation which provides incentives for the business sector at national and international level.

3.4 Selected experiences

3.4.1 Guaranteeing the credibility of a mechanism – Lessons of the CDM

The CDM was initially seen as the least attractive of the Kyoto Mechanisms due to the risk of investing in emissions mitigation in developing countries and the huge bureaucracy required to check whether projects were actually additional and whether emissions reductions were real. International emissions trading was seen as having much lower transaction costs and Joint Implementation would benefit from the good investment climate in industrialized countries.

[6] FCCC/AWGLCA/2011/MISC.2 and FCCC/AWGLCA/2011/MISC.2/Add.1

Nevertheless, the CDM became the most successful of the Kyoto Mechanisms. This was due to the fact that emissions credits are granted by an international institution without interference of the host country government. This enabled to avoid governmental corruption, especially due to the higher transparency of the CDM process in comparison to the Joint Implementation (JI) process. While the CDM project cycle is cumbersome, it has led to full fungibility of credits and their general acceptance as compliance tools. Only recently, media and NGO pressure has weakened the trust in CERs, leading to the EU decision to ban imports of certain credit types.

Moreover, companies in developing countries, especially the BASIC countries, discovered that CERs are a valuable export commodity, leading to a race to unilaterally develop CDM projects. This had not been foreseen by anyone and is the key secret of CDM success.

The high expectations for JI were shattered when host country governments bickered for years regarding rules how to allocate ERUs and were unclear about the approval rules. International emissions trading suffered from high profile corruption cases when government officials sold AAUs at prices well below market value.

The lessons from the CDM are thus that the availability of a transparent incentive for private companies on the international level which cannot be taken away by governments of low credibility can mobilize significant mitigation action. This means that sectoral crediting mechanisms should be designed in a way that minimizes involvement of host country government other than preventing free riding.

3.4.2 Examples of successful policies in developing countries

The transition from a project based to a sectoral mechanism will require an enhanced role for government actors. However, successful policies in developing countries have already been implemented in the past and provide important lessons for how private entities can be incentivised to reduce their emissions under a sectoral approach in the future. The following three case studies from developing countries demonstrate how different combinations of incentive instruments and measures can be adopted in order to encourage emission reductions.

The eleventh Five Year Plan in China

In China, the target of a 20% reduction in energy intensity was set for the country's eleventh Five Year Plan (2006-2010). A combination of financial incentives and mandatory regulations ensured that by 2010 the country achieved a 19.1% reduction in energy intensity (Hannon et al. 2011). Although it was necessary for the government to intervene and close small inefficient plants in 2010 to meet the energy intensity target, which was both socially and economically disruptive, various policies incentivising emission reductions also made an important contribution. In particular, the Top 1000 Energy Consuming Enterprise Programme and the Ten Key Projects Energy Efficiency Programme delivered primary energy savings of 124 Mtce and 102 Mtce respectively in 2006-2008 (Hannon et al. 2011).

In order to encourage energy intensity improvements in China's industrial sector, the Top 1000 Energy Efficiency Programme was established. Energy saving targets were set for China's 1,000 largest state-owned enterprises. Every company participating in the programme was required to develop an energy efficiency action plan showing how the target would be achieved. It was expected that these action plans would include measures to improve the reporting of energy consumption, conduct energy audits and identify and invest in energy efficiency improvements. In addition to setting the energy saving target, the Chinese government instructed local authorities to supervise and monitor the participating firms in the implementation of their energy efficiency action plan. In November 2009, NDRC announced that the Top 1000 programme had reached its target energy savings of 100 Mtce (Price et al. 2010).

Given that the programme was rapidly implemented, there was insufficient time for a detailed assessment to determine the energy saving target of each company. As a consequence, it may be argued that the energy saving target for the Top 1000 Energy Efficiency Programme (i.e. 15% of the total energy savings required in the eleventh Five Year Plan) was not ambitious enough (Price et al. 2010). Therefore it is important to acknowledge that target setting needs to reflect abatement potential. In addition, many companies experienced difficulties in completing energy audits due to the lack of qualified auditing personnel. Capacity building in auditing and monitoring thus remains essential to the effectiveness of energy efficiency programmes. However, although lessons need to be learnt, the Top 1000 Energy Efficiency Programme is generally considered a success and demonstrates how private entities can be incentivised through the setting and monitoring of top-down targets by government actors.

The aim of the Ten Key Projects Energy Efficiency Programme was to deliver an energy saving of 250 Mtce during the eleventh Five Year Period by allocating targeted funding (i.e. approximately 1 billion USD) to energy efficiency projects (WRI 2009). For example, one objective of the program was to increase the efficiency of coal burning boilers and kilns by five and two percentage points (Energy Bulletin 2011). The renovation of medium and small sized boilers with advanced techniques such as pulverised coal firing were incentivised by allowing companies to apply for funding from China's Ministry of Finance. After a comprehensive energy audit, and following accounting and management system checks, an eligible company would receive 60% of the project's capital cost upfront, with the remaining 40% provided after the technology was installed and subject to an evaluation of the energy savings (WRI 2009). Such a payment structure 'rewarded' companies that successfully completed energy saving projects. Based upon the data for 2006-2008 it is expected that the programme achieved its target energy saving (Price et al. 2010).

Ethanol Programme in Brazil

In response to the oil crisis of 1973, the Brazilian government initiated a programme to incentivise the production of large quantities of ethanol from sugarcane (PROALCOHOL) as a replacement fuel for gasoline. Given that Brazil was the world's third largest sugar producer with five million tonnes of raw sugar equivalent in 1975 and that the product was valued at a low price for a long period in the international market, the decision was made to divert some of the sugarcane to ethanol production (Goldemberg 2006). The PROALCOHOL programme involved both compulsory and voluntary measures to stimulate demand for ethanol. Firstly, there was a compulsory requirement to use 10% anhydrous ethanol as an additive to gasoline, which did not require any changes to existing vehicles. Secondly, there was a voluntary requirement to use 100% hydrated ethanol in modified vehicles (Goldemberg 2006).

The PROALCOHOL programme increased the production of ethanol and, by 1981, a quarter of the cars sold in Brazil were fuelled by alcohol (Trennepohl 2010). Essential to the success of the programme was the agreement from the automobile manufacturers in the country to produce vehicles with converted motors. Such an agreement was only possible because the PROALCOHOL programme guaranteed the availability of ethanol in the fuel stations across the country (Goldemberg 2006). The Brazilian government primarily supported this programme through the provision of soft loans to the sugarcane farmers (i.e. to invest in ethanol distilleries) and to the consumer by subsidising the price of ethanol at the pump (Goldemberg 2006). According to Nunes (2007) the subsidy ensured that the ethanol price was set lower than the gas price (i.e. < 65%). Although sales in cars fuelled by alcohol subsequently decreased in the late 1980s and early 1990s, coinciding with lower oil prices and the removal of subsidies, the PROALCOHOL programme demonstrates how private entities can be incentivised to change their business operations in response to the introduction of regulation and financial incentives.

Energy Efficiency Programme in Thailand

During the 1990s the electricity demand in Thailand was increasing rapidly, with lighting representing 25% of national electricity use in the country (Birner 2000). As a consequence a comprehensive five year demand side management (DSM) programme was set up by the Thai national electric power utility (EGAT) in 1993. The new DSM office implemented several market interventions for energy efficiency, which did not rely upon the use of subsidies. Instead EGAT encouraged energy efficiency improvements through various collaborations with manufacturers and public promotions (Birner & Martinot 2003). The switching from thick (T-12) to thin (T-8) fluorescent tubes provides an example of how the DSM programme successfully intervened in the market. By financing an $8 million consumer information campaign highlighting that the T-8 tubes provided the same quality of lighting as the T-12 tubes whilst consuming less energy, the EGAT secured an agreement with the importers and manufactures of T-12 tubes to switch to T-8 tubes. As a consequence of this market intervention the market share of T-8 tubes increased from a 40% share in 1994 to a 100% market share by the end of 1995 (Birner & Martinot 2003).

The introduction of energy efficiency labelling was another effective market intervention by EGAT in the manufacture of refrigerators. EGAT negotiated a voluntary labelling scheme for refrigerators based upon efficiency performance. This was again supported by an advertising campaign to promote the energy efficiency standard to consumers and EGAT ensured that there was sufficient capacity to audit refrigerator models by partnering with a technical standards institute to test the refrigerators. The scheme was subsequently made mandatory with an increase in the energy efficiency requirements for the labelling scheme. The impact of the programme was impressive. In 1994, only one single door model and 2% of double door models qualified for the highest energy efficiency level. By 2000, all single door and 60% of double door models qualified for the highest efficiency level (Birner & Martinot 2003). The experience in Thailand demonstrates that voluntary agreements can be effective when industry have confidence in government policies to transform the market. The empowerment of consumer choice, through the introduction of energy efficiency labelling and information, can also facilitate necessary market transformations.

3.5 Implications for the concept of sectoral mechanisms

Sectoral mechanisms strive to trigger investments into sectoral greenhouse gas mitigation activities. In particular under the scenario of a sector with mainly private owned emitters that faces a sectoral no lose target, incentives to invest into mitigation might be low if investors do not get guarantees to receive an equivalent for their investment, e.g. in form of credits. It is thus required to design the implementation of a sectoral mechanism in a way that prevents free riding and provides guarantees to investors. Otherwise private investments will be alienated by the lack of credibility.

As the lessons of a decade of CDM show, the availability of a clear incentive was the key pillar of success. Thus, sectoral mechanisms will only be successful if private companies see such an incentive that has a fair chance of surviving in the long run. The discussion on the role of government has shown that the increased responsibility of the government under a sectoral mechanism requires strong governance of implementing domestic mitigation policies. Therefore, sectoral mechanisms may initially be implemented only in selected developing countries. However, examples of successful climate mitigation policies illustrate that several countries have a good track record in implementing such policies and that a number of developing countries would be eligible for establishing sectoral mechanisms.

In terms of measures, host country governments should concentrate on providing policy instruments that prevent free riding. The fact that a sectoral crediting threshold is no lose for the country as a whole does not necessarily imply that the implementation of the mechanism within the country needs to be no lose as well.

Emissions above the threshold could be penalized by a mandatory regulation or an emissions tax, which would provide a clear message that emissions reductions achieved by one company are not diluted by the non-action of its competitor. Alternatively, subsidies such as feed in tariffs could be used to provide a clear monetary incentive to the private sector. These incentives would however not be directly linked to the global carbon market. The credits would just serve to reduce the government’s budgetary burden in the case of a subsidy or to increase revenues in the case of an emission tax. Last but not least sectoral mechanisms can domestically also be implemented as a mandatory emissions trading scheme. Such an approach would establish a direct link to the carbon market and provide strong mitigation incentives at activity level.

However, each host country and each sector is different. Investors, in particular from industrialised countries, will only invest if (i) they trust in the respective government and (ii) believe the implementation of the mechanism is credible enough. In order to build confidence in this regard, pilot schemes should be set up rather sooner than later. Many concerns on lacking incentive structures of sectoral mechanisms will disappear once the new market-based approach is established as long as CDM is currently established.

3.6 References

Baron, R.; Buchner, B.; Ellis, J. 2009: Sectoral Approaches and the Carbon Market. OECD/IEA, Paris, http://www.oecd.org/dataoecd/8/7/42875080.pdf

Birner, S. 2000: How Thailand Washed Away Wasteful Lighting. IAEEL newsletter 1-2/00, http://www.iaeel.org/iaeel/newsl/2000/Etttva2000/PrN_a_1-2_00.html

Birner, S.; Martinot, E. 2003: Market transformation for energy efficient products: lessons from programs in developing countries. Energy Policy, http://keionline.org/misc-docs/Birner_Martinot_EP.pdf

Energy Bulletin 2006: China outlines ten programs for energy efficiency http://www.energybulletin.net/print/3566

Goldemberg, J. 2006: The ethanol program in Brazil. Institute of Physics Publishing. http://iopscience.iop.org/1748-9326/1/1/014008/pdf/erl6_1_014008.pdf

Hannon, A. et al. 2011: Delivering Low Carbon Growth, A Guide to China's 12th Five Year Plan. The Climate Group

IETA (International Emissions Trading Association) 2010: Thinking Through the Design Possibilities for a Sectoral Crediting Mechanism - Three Options to Encourage Discussion. Genf, http://www.ieta.org/ieta/www/pages/getfile.php?docID=3408

Nunes, A. 2010: Developing the EV Market in Brazil http://www.inee.org.br/down_loads/veh/DevelopingTheEVMarketInBrazil.pdf

Price, L. et al. 2010: Assessment of China's Energy-Saving and Emission Reduction Accomplishments and Opportunities During the 11th Five Year Plan. Energy policy

Schmidt, J.; Helme, N.; Lee, J.; Houdashelt, M. 2006: Sector based approach to post 2012 climate change policy architecture. CCAP (Center for Clean Air Policy), Washington/DC,

Schneider, L.; Cames, M. 2009: A framework for a sectoral crediting mechanism in a post-2012 climate regime. Öko-Institut, Report for the GWEC (Global Wind Energy Council), Berlin, http://www.oeko.de/oekodoc/904/2009-022-en.pdf

Trennepohl, N. 2010: Brazil's Policy on Climate Change - Recent Legislation and Challenges to Implementation. In: The Carbon & Climate Law Review (CCLR), Vol. 4, No. 3, pp. 271-277

Whitesell, W.; Helme, N. 2009: A tradable intensity standard for sector crediting. Center for Clean Air Policy (CCAP), Washington/DC, unpublished manuscript

World Resource Institute (WRI) 2010: China's Ten Key Energy Efficiency Projects. ChinaFAQs - The network for Climate and Energy Information. http://www.chinafaqs.org/files/chinainfo/ChinaFAQs_China's_Ten_Key_Energy_Efficiency_Projects.pdf

4 Solving the MRV challenge for new market-based mechanisms: What can past experience teach us?

Work package 3, by Paula Castro, Daisuke Hayashi, Martin Stadelmann, Axel Michaelowa (IPZ), Martin Cames, Sean Healy (Öko-Institut), 23 November 2011

The new market-based mechanisms (NMBM) being discussed in the climate change negotiations will require a monitoring, reporting and verification (MRV) system that enables a transparent accounting of their contribution to greenhouse gas (GHG) emission reductions. Two existing strands of MRV can provide lessons for designing this new system: MRV of project-based market mechanisms such as the Clean Development Mechanism (CDM) under the Kyoto Protocol and MRV of national climate change mitigation actions and greenhouse gas inventories.

For project-based market mechanisms, such as the CDM, MRV is an essential element to ensure environmental integrity. While the wording of "MRV" is not explicitly used, all CDM projects are required to monitor greenhouse gas emission reductions, to compile monitoring reports and to submit these reports to external verification. However, MRV under the CDM cannot be simply transferred to those NMBM that will address national or sectoral actions,[7] rather than project-based interventions as in the CDM. Therefore, the existing MRV of national mitigation actions and targets of industrialised countries – which are sometimes structured along specific sectors and industries – is a valuable experience that can inform the design of MRV for NMBM.

For national mitigation actions, MRV elements have already been included under both the United Nations Framework on Climate Change (UNFCCC) in 1992 and the Kyoto Protocol in 1997.[8] However, the wording of MRV was only introduced under the Bali Action Plan in 2007, when countries agreed to undertake measurable, reportable and verifiable (MRV) Nationally Appropriate Mitigation Actions (NAMAs), in the case of developing countries "supported and enabled by technology, financing and capacity building" (UNFCCC 2007). The emergence of new market-based mechanism proposals in subsequent COP negotiations represents a challenge to policy makers on how best to design MRV systems that ensure environmental integrity, consistency with the existing system, avoid overlap between MRV of NAMAs and of new market-based mechanisms, and are accepted by the international community.

This discussion paper analyses how a MRV system for the new market-based mechanisms can be designed so that it complies with the criteria of environmental integrity, data availability, transparency, cost-efficiency, a sound institutional framework and transferability. To do so, in a first step, the general academic and political discussion on MRV is summarized; then, lessons are drawn from existing MRV systems in the CDM, the EU ETS and a voluntary sectoral reporting initiative; and finally, proposals are put forward for the MRV of new sectoral market-based mechanisms.

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7 While the negotiations regarding new market-based mechanisms are still open regarding the form that these new mechanisms will take, in this study we focus mostly on sectoral market mechanisms, particularly sectoral crediting and sectoral trading.

8 The reporting requirement under the Kyoto Protocol are very different: while developing countries are only requested to report on programmes containing mitigation measures in their national communications (normally, every 5-15 years), industrialized countries have to submit more regular and detailed national communications, and every year an inventory of greenhouse gas emissions (UNFCCC 2007).

4.1 Overview of the academic and political discussion

In the following we provide an overview of the academic and political discussion on specific MRV requirements for sectoral mechanisms. We will firstly outline the objective of MRV before providing a more detailed description of the three components and desirable characteristics of MRV systems that may be suitable for sectoral mechanisms.

According to Breidenich & Bodansky (2009), the role of MRV in any new agreement for a post-2012 climate regime is multifaceted. The three components of an MRV system may facilitate progress towards a new climate agreement by:

- Measuring the progress of countries towards the objective of an agreement, this may encourage international collaboration on the establishment of baselines and the identification of mitigation potentials;
- Reporting the mitigation actions of a country to recognise their effort at an international level, which will allow for independent review of these mitigation actions with the possibility of learning from them and improving policy measures where necessary;
- Verifying the outcome of the mitigation actions that are reported and measured by a country ensuring that there is *mutual confidence* in the action of countries' and in the climate regime itself.

In essence, the fundamental objective of an MRV system is to provide credibility to a new agreement on the post-2012 climate regime; and such credibility is vitally important in order to maintain the mutual confidence of participating countries in the process. Given that the nature of any obligations (commitments, support, actions, etc.) and MRV systems is not explicitly defined in the Bali Action Plan, both are subject to ongoing negotiations at the COP level (Fransen 2009).

Within these negotiations, the role of new market-based mechanisms and the conditions necessary to enable emission reductions to be measured, reported and verified are being carefully considered. To a certain extent, the terms *measurable*, *reportable* and *verifiable* are all closely linked, however it is important to acknowledge that each component of MRV presents a distinct set of issues concerning the design of MRV systems for new market-based mechanisms.

Breidenich & Bodansky (2009, p. 3) define the function of **measurement** as a means "to describe a phenomenon in reasonably precise, objective terms – that is, in terms of an established standard or unit of measurement." The unit of measurement can refer to both direct physical measurement as well as an estimation based on indicators, which can be quantitative or even qualitative. For example, national emission inventories are often based upon an estimation of GHG emissions that are derived from the product of activity data and GHG emission factors. Although measurement is normally associated with quantification, "it can also be based on qualitative metrics, provided that they can be evaluated in an objective manner" (Fransen 2009, p. 2).

Reporting involves the provision of information by all countries that have approved the terms of an international agreement. Breidenich & Bodansky (2009) suggest that the provision of information may include national conditions (GDP, climate, etc.), government policies and measures (tax policies, subsidies, etc.), environmental results (emission levels, etc.) and private activities (activity levels, technology investments, etc.). Successful reporting depends upon "the precision and reliability of the reported information" by actors (i.e. states, business actors, non-governmental actors, independent experts and international institutions) and "the degree to which information is presented in a transparent and standardised way that allows comparison between reports and verification by others" (Breidenich & Bodansky 2009, p. 5).

Verification refers to "the process of independently checking the accuracy and reliability of reported information or the procedures used to generate information" (Breidenich & Bodansky 2009, p. 6). Verification is considered a technical non-judgemental function, which involves the factual accuracy of information. It is therefore a distinct term, which is not necessarily either political (i.e. a review) or legal (i.e. compliance) in nature (Breidenich & Bodansky 2009). The verification of the mitigation action of a country is dependent upon the extent to which data is capable of being verified (i.e. quantitative and qualitative data), the actors involved (other states, accredited private entities, NGOs, etc.) and the way in which the verification process is implemented (onsite inspections, onsite monitoring, remote monitoring, etc.). The way in which sectoral mitigation actions of countries can be monitored, reported and verified depends upon the sectoral approach implemented.

The introduction of sectoral crediting (i.e. the issuance of credits for the difference between actual emissions in a sector and the crediting threshold) or sectoral trading (i.e. the definition of a sectoral cap and the issuance of tradable emission permits up to that cap) would require reliable, transparent and standardised data on sectoral emission reductions. The determination of emission reductions would require a measurement of actual emissions and the establishment of quantified baseline projections (Ellis & Moarif 2009), which would be particularly challenging to determine "since the future development of GHG emissions are driven by many factors, such as economic growth, population growth, international fuel prices, technological innovation" (Schneider & Cames 2009). Indeed, the identification of a baseline projection may be complicated further if it refers to a sub-sector as the interaction of separate mitigation actions by a country within the same sector may impact baseline calculations (Jung et al. 2010). In addition, the reporting and verification of information would be more difficult to implement if activities are defined at the sub-sector level and differ from the sectoral disaggregation used in official statistics (Ellis & Moarif 2009).

It is evident that the existing monitoring and reporting requirements under the Kyoto Protocol will have to be further developed to enable emission reductions from new market-based mechanisms to be *measured, reported and verified*. According to Fransen (2009), even the national communications and inventories for Annex I Parties are currently not adequate to contribute to MRV under a post-2012 agreement. Given the less stringent requirements for non-Annex I Parties, they would even be less appropriate as a basis for future MRV. This may be particularly true for the MRV requirements of new market-based mechanisms because the required sectoral information may currently not (or not accurately) be reported in national communications. However, attempts should be made to build upon the existing monitoring and reporting procedures that have widespread support amongst the Parties to the Kyoto Protocol.

It is suggested that the post-2012 framework needs to extend monitoring requirements to developing countries. Given that new market-based mechanisms are designed to realise mitigation potentials in certain sectors of developing countries, it is essential that the inventories of the developing countries with significant emissions become more frequent and complete.

Many countries have advanced the concept of a registry to recognise the mitigation efforts of developing countries in the international framework and to prioritise the distribution of financial and technology support from developed countries. While the idea of a registry has widespread support in principle, the way it would operate is still subject to ongoing negotiation with the MRV requirements potentially varying depending upon the type of NAMA (unilateral, supported or market-based), the market mechanism used (crediting or trading) and the national circumstances of the developing country (McMahon et al. 2009). However, if the outcome of the negotiations in terms of MRV stringency is weak, the credibility of the underlying agreement would be reduced.

In conclusion, the fundamental purpose of MRV is to communicate progress and provide credibility for the mitigation actions of a country in a manner that is internationally comparable with the efforts of other parties to an environmental agreement. The emergence of new market-based mechanisms in a post-2012 agreement presents various challenges to how information is currently measured, reported and verified. From a technical perspective, it is evident that the measurement of data at a sectoral or even sub-sectoral level will require additional skills and capacities to define sectoral boundaries and baselines. Furthermore, reporting and verification processes will require data to be more disaggregated and standardised amongst all of the participating countries. From a political perspective, there needs to be an international agreement on a MRV system that would extend beyond the Kyoto Protocol Parties to include MRV procedures for non-Annex I countries. These technical and political challenges will need to be addressed to ensure *mutual confidence* amongst the Parties in order to provide the necessary conditions for new market-based mechanisms in a post-2012 regime to succeed.

4.2 Description of criteria for analysing existing MRV systems and designing new ones

The main purpose of MRV systems is to safeguard environmental integrity. Therefore MRV systems need to comply, inter alia, with following principles (EU 2004, p. 4-5):

- Completeness: All greenhouse gas emissions from all sources covered by the respective scheme need to be monitored and reported.
- Accuracy: emission determination should be systematically resulting in data neither under nor over actual emissions; uncertainties should be reduced as far as practicable and quantified to the extent possible; metering and testing equipment used to monitor emissions should be calibrated and regularly maintained; data processing tools used in determining emissions should be free from errors.
- Conservativeness: in the interest of environmental integrity, wherever uncertainties in determining emission levels are remaining, it is better to err on the lower bound (underestimating the emission reductions).
- Materiality: Only information whose omission or misstatement could influence the decision of users should be taken into account; in that sense, materiality provides a cut-off threshold for the size potential of omissions or misstatements.
- Consistency: Emission data should be comparable over time by using the same monitoring methodologies; monitoring methodologies should only be changed if the new methodology ensures improved completeness or accuracy.

- **Cost effectiveness**: the accuracy of monitoring methodologies should be balanced against the additional cost; those methodologies should be applied which provide the highest accuracy unless their application is technically unfeasible or would lead to unreasonable high cost.
- **Adjustability**: monitoring methodologies should be improved if more accurate data or methodologies become available.
- **Transparency**: all data required to determine emissions, including activity data, emission factors, assumptions, references, etc., should be analysed and recorded in such way that it can be reproduced by surveillance entities.

Some of these criteria are conflicting so that a balance between them needs to be identified (e.g. consistency versus improvement). How that balance would look like cannot be determined in general but depends on the detailed circumstances of the respective subject that needs to be monitored, reported and verified.

Based on these principles we derive the following criteria for the assessment of existing sectoral MRV systems:

Criterion	Key questions
Environmental integrity	Does the MRV system safeguard environmental integrity by ensuring high levels of completeness, accuracy and consistency? Is conservativeness guaranteed?
Data availability	Are all the data required to determine baseline and actual emissions available, including activity data, emissions or conversion factors, etc.? To which extent data needs to be gathered before the start of the system and which data may be considered sensitive since it would be considered as confidential business data?
Transparency	Are the emission data gathered made publically available for any interested person or body? Are additional data made publically available and if yes, which additional data?
Cost-efficiency	Does the MRV system result in unreasonably high cost? How could the costs of MRV be reduced without undermining environmental integrity?
Institutional feasibility	Which bodies need to be established to apply the MRV system and to which extent already existing bodies can be mandated with the required tasks?
Transferability	In which context is the MRV system applied so far? Can it be transferred to developing countries and which criteria in terms of size, governance, institutional framework, etc. those countries need to comply with?

The existing MRV systems will be analysed in a qualitative manner on the basis of these criteria, taking into account the actual circumstances of the context where the system is applied up to now.

4.3 Analysis of existing MRV systems

4.3.1 European Union Emissions Trading Scheme

The monitoring and reporting of greenhouse gas emissions in the EU Emissions Trading Scheme (ETS) is based upon the guidance provided by the Commission Decision 2004/156/EC. The coverage of the EU ETS includes any combustion installation with a rated thermal input exceeding 20 MW and the operators of these installations are required to adhere to the monitoring and reporting guidelines expressed by the Commission in order to use emission permits (Directive 2003/87/EC).

A *monitoring methodology* needs to be submitted by the operator of an installation to the *competent authority*, which describes the activities carried out by an installation to be monitored and the methodology used "for the determination of emissions, including the choice between calculation and measurement and the choice of tiers" (Decision 2004/156/EC).

The monitoring and reporting guidelines provided in the Commission Decision 2004/156/EC establish a tier system for the calculation of greenhouse gas emissions defining a hierarchy of different accuracy levels for activity data, emission factors and oxidation or conversion factors. In principle the operator is obligated to apply the highest tier level (i.e. the highest level of accuracy) unless this is technically or economically not feasible.

The use of a measurement based methodology (i.e. metering devices) to monitor the greenhouse gas emissions of an installation can only be implemented if the output is more accurate than the calculation based methodology. The accuracy of measurement is determined based on the level of uncertainty associated with metering equipment, calibration and "any additional uncertainty connected to how the metering equipment is used in practice" (Decision 2004/156/EC).

The operator of the installation is required to report the monitoring of greenhouse gas emissions in accordance with the reporting format outlined in the Decision 2004/156/EC and to ensure that all monitoring methodologies are subject to independent verification.

Environmental Integrity

Completeness: "The monitoring and reporting process for an installation shall include all emissions from all sources belonging to activities listed in Annex to the Directive 2003/87/EC" (Decision 2004/156/EC). Despite this objective of being complete, two aspects need to be discussed here. Only installations above 20 MW of thermal input are part of the EU ETS system. While reducing costs of monitoring, this approach may lead to leakage to smaller installations. An additional aspect is how emissions from electricity are accounted for. Under the EU ETS, electricity emissions are accounted through the allocation of allowances to power generation companies, which are supposed to pass the higher cost of GHG emitting electricity to their consumers. In order not to price electricity emissions doubly, they are thus not included in the accounting for industrial installations. While this approach is appropriate for the EU ETS due to its broad coverage, it may not be appropriate for sectoral market mechanisms in developing countries, as in this case there is no certainty that emissions from electricity use or consumption are accounted for. If they are not, and the benchmark or baseline for the sector only considers direct emissions (e.g. from fuel combustion during the production process), this could create the perverse incentive to increase the use of electricity in order to substitute fuel combustion.

Accuracy: The accuracy of the monitoring and reporting is ensured within the MRV system by obligating the operators of installations to conform to the highest level of accuracy as defined by the *tier approach* (unless this is not technically or financially feasible) when using either the calculation or measurement based methodology. However, the European Environment Agency (EEA 2006) reports difficulties in the implementation of this tiered approach: during the ETS Phase I, in some countries the minimum tiers were not yet technically feasible by 2005. In about 20% of the installations above 500 kt annual emissions, either the activity data, the emission factor or the net calorific value could not be calculated according to the minimum tier requirements for at least one fuel. This shows that, even if the regulations try to ensure data quality, during implementation the strict requirements had to be adapted to the reality of the sectors, at least during an initial learning period.

Conservativeness: To determine how many emission allowances should be allocated to new installations, a benchmark approach was introduced, and each member country established its own benchmark. Hermann (2010) discusses that the benchmarks in the cement sector were set in most countries on the basis of the best available technology (BAT), which should ensure accuracy in determining desirable emission levels. However, a case study of the German cement benchmark shows that even when utilising BAT as the basis for the benchmark, this one was not stringent enough, because it did not take into account the high share in use of waste fuels for the clinkering process, because the load factor chosen was too high, and because there were different benchmarks for different technologies, failing to set an incentive to make broader technological improvements.

Consistency: The emission data monitored is comparable over time, with the monitoring methodology only changed if the accuracy of the reported data is improved (Decision 2004/156/EC).

Data Availability

Data available: In the context of the power sector, the calculation of greenhouse gas emissions from combustion is the product of fuel consumption, an emission factor and an oxidation factor (Decision 2004/156/EC) with the accuracy (i.e. certainty) of the data dependent upon the tier approach. For example, according to the Commission Decision 2004/156/EC the use of an emission factor of a fuel may be determined by using either "reference factors for each fuel as specified in section 8 of Annex I" (i.e. Tier 1) or alternatively by referring to country specific emission factors for the fuel type as 'reported by the respective Member State in its latest national inventory submitted' to the UNFCCC (i.e. Tier 2a).

The flexibility provided by this tier approach in the MRV guidelines (Decision 2004/156/EC) ensures that data in most circumstances are available for installations to calculate their greenhouse gas emissions whilst also documenting a transparent way to improve the quality of monitoring over time.

Data to be collected: If the measurement based approach is implemented by an operator of an installation to monitor greenhouse gas emissions, the measurement data will need to be frequently collected along with information on the uncertainty associated with the measurement. Otherwise, data on fuel consumption is used for the calculation based methodology.

Transparency

Public availability of emission data: In the EU ETS, the greenhouse gas emission data are made publically available on an annual basis to ensure complete transparency. The operators of the installations covered in the scheme are required to report emission data according to the format set out in the Commission Decision 2004/156/EC.

Public availability of additional data: Information is also provided on the number of permits submitted, purchased/sold or banked at the end of the year for each installation.

Cost-efficiency

Cost of MRV system: The tier approach outlined in the MRV guidelines provides a balance between the accuracy of monitoring and the additional cost of the methodology.

Reduction of MRV costs: Provisions are included within the Commission Decision 2004/156/EC to ensure that if the monitoring and reporting of information at a certain level of accuracy leads to *unreasonably high costs* for the operator of an installation, then information can be monitored and reported according to a lower tier of accuracy. However, the competent authority must be satisfied that this is the case before allowing an installation to collect information at a lower level of accuracy.

Institutional Framework

Responsible authorities: The monitoring and reporting of greenhouse gas emissions in the EU ETS system required the establishment of registries to account for the greenhouse gas emissions of the participating installations. National authorities have been responsible for setting up registries to facilitate emissions trading. In addition to the registration of verified emissions, this involves accounting for the surrender of permits at the end of the year by installations along with additional information on the selling or purchase and banking of permits. According to EEA (2006), in most participating countries, more than one authority is involved in the national implementation of the EU ETS, and sometimes emissions monitoring and issuance of permits is carried out by local or regional authorities. To avoid inconsistencies in implementation at the national level, working groups with regular meetings, specific guidance notes and/or training courses for the authorities have been carried out.

In addition, a network of independent accredited verification bodies has been established to ensure that the monitoring and reporting of emissions by the operators of the participating installations were implemented in accordance with the MRV guidelines.

Transferability

Applicability of MRV system in developing countries: Based upon the lessons learnt from the EU ETS, a similar scheme for developing countries may be feasible if technical support is provided. The implementation of NAMAs may act as a first step (akin to the EU ETS phase I) towards improved MRV of greenhouse gas emissions to implement a similar scheme in the future. One possible implementation would be to establish market-based pilot schemes in developing countries, which already receive emission units (credits or allowances) that are fully fungible with the international system. However, to ensure environmental integrity during this pilot, either the issuing body would issue less credits than those verified or the buying party would cancel part of the credits received.[9]

4.3.2 Power under the CDM

There are a number of CDM baseline and monitoring methodologies for projects in the power sector. As an example we analyse the consolidated baseline and monitoring methodology ACM0002.[10] This methodology is applicable to CDM projects that either install, increase capacity, retrofit or replace grid-connected electricity generation from renewable sources (hydro, wind, geothermal, solar, wave or tidal power).

Depending upon the CDM project type covered by this methodology, the identification of a baseline scenario will be slightly different. For example, the installation of a new grid-connected renewable power plant/unit assumes that the electricity delivered to the grid by the project activity would have otherwise been generated by the existing electricity grid, which is associated with a specific emission factor. Alternatively a capacity addition to an existing grid connected renewable power plant/unit assumes in the baseline scenario that in the absence of the CDM project activity the existing facility would continue to supply electricity to the grid at historical levels.

The identification of such baseline scenarios for CDM projects and the subsequent demonstration of additionality through tests such as the barrier analysis and investment analysis are essential elements of the CDM project cycle.

The issuance of CERs will depend upon the emission reductions that are estimated to occur from the displacement of electricity generation from fossil fuel power plants during the proposed crediting period of the CDM project activity (i.e. installation, capacity addition, retrofit and replacement). Independent verification by Designated Operational Entities (DOEs) is required to ensure that all Certified Emission Reductions (CERs) issued for emission reductions to CDM project developers are real.

Environmental Integrity

Completeness: All of the main greenhouse gas emission sources for the baseline scenario (i.e. CO_2) and the project activity (i.e. CO_2, CH_4) are accounted for in methodology ACM0002.

Accuracy: As an offsetting mechanism, the CDM projects currently depend upon the concept of additionality to ensure their environmental integrity. A project is regarded as additional if it would not have been implemented without the incentive from the CDM. This is demonstrated in methodology ACM0002 through a barrier analysis and (in most cases) an investment analysis. However the current approach has been criticised as being very subjective and difficult to validate in an objective manner.

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[9] It is not advisable to introduce different kinds of tradable units here (as in the case of afforestation/reforestation projects in the CDM), because this would lead to fragmentation of the market.

[10] http://cdm.unfccc.int/methodologies/DB/C505BVV9P8VSNNV3LTK1BP3OR24Y5L

The ability to accurately measure the GHG reductions that result from CDM projects covered by the methodology is also an essential requirement for maintaining environmental integrity. In order to achieve this accuracy within methodology ACM0002, the quantity of net electricity generation annually supplied to the grid by the plant or unit that has been added under the project activity is required to be measured using electricity meters. The use of such a measurement device, which is used according to relevant industry standards, ensures a high level of accuracy on the amount of electricity generated. While this data on produced electricity is very accurate, the overall estimation of emission reductions in ACM0002 relies on less accurate data on emissions produced by existing power plants (Michaelowa 2011) and at least three challengeable assumptions: First, the methodology assumes that mainly power from coal, oil and gas power plants are replaced but no generation from renewable energy and nuclear (exception: largely hydro-based grids). Second, the methodology assumes 100% replacement of other electricity as consequence of renewable electricity production. Third, ACM0002 assumes that the replaced emissions can be accurately estimated by taking specific weights for emissions from all power plants on the grid and for emissions of the recently built power stations. Therefore, the calculated emission reductions represent a "best estimate under specific assumptions" rather than an exact value (which can never be attained).

The monitoring of emissions associated with the production of electricity from geothermal and solar thermal projects requires a calculation of the annual fuel consumption based upon emission factors approved by the CDM Executive Board.

Consistency: The requirement for the continuous measurement of the net electricity generation annually supplied to the grid by the plant or unit that has been added under the project activity should ensure that the data will be comparable over time. The CDM Executive Board will only approve changes to methodology ACM0002 if the accuracy or completeness of the data can be improved.

Data Availability

Data available: Methodology ACM0002 refers to the use of several tools approved by the CDM Executive Board to calculate the emission factor for an electricity system, to demonstrate and assess project additionality, to identify the baseline scenario and to calculate project emissions from fossil fuel combustion.

Data to be collected: The quantity of net electricity generation supplied by the project plant/unit to the grid needs to be measured, and data on the GHG-intensity of the grid (if not already published by national institutions) needs to be collected for CDM projects covered by methodology ACM0002.

Transparency

Public availability of emission data: The UNFCCC publishes information on the CERs issued to all of the CDM projects that have successfully completed the MRV requirements associated with the CDM project cycle.

Public availability of additional data: Information on the status of a CDM project (i.e. registered, rejected, under review) is also available from the UNFCCC, as well as the Project Design Document (PDD) detailing the project's baseline and monitoring methodology and its projected emission reductions.

Cost-efficiency

Cost of MRV system: Transaction costs (i.e. project identification, methodology development, project documentation) are an important factor influencing the cost-effectiveness of the CDM. The cost of monitoring, reporting and verifying the emission reductions from CDM projects results in considerable costs and risks to the CDM project developer and particularly undermine the incentive for developing small-scale renewable projects.

Institutional Framework

Responsible authorities: The CDM Executive Board supervises the CDM and is responsible for the registration of CDM projects and the issuance of CERs. A Methodologies Panel was established to support the CDM Executive Board by providing recommendations on methodologies for baselines and monitoring plans. Designated Operational Entities (DOEs) are responsible for independently validating the PDDs and verifying the emission reductions reported by a project owner. In addition, a Designated National Authority (DNA) is required to approve the development of a CDM project proposed by a CDM project developer.

The CDM institutional framework has been criticised due to its low effectiveness in dealing with the large flow of projects (both at the DOE and the CDM Executive Board level), and to misaligned incentives for DOEs, which by being hired by the project proponents have an incentive to satisfy the client and facilitate registration, rather than to ensure environmental quality (e.g. Lund 2010).

Transferability

Given that the CDM is an offsetting mechanism to facilitate emission reductions in developing countries, the MRV system is already applied to developing countries. However, the CDM relies upon international institutions and capacity building would therefore be necessary if the MRV system would only be administered by developing countries.

4.3.3 Cement under the CDM and the Cement Sustainability Initiative

The proposed CDM methodology NM0302 "CDM methodology for cement and clinker production facilities based on benchmarking (version 2.0)" was developed by the Cement Sustainability Initiative (CSI), building on its voluntary protocol for calculating and reporting CO_2 emissions from the cement sector, The Cement CO_2 Protocol (the CSI Protocol). Because of the close similarity between these two MRV systems, this section analyses both systems together.

NM0302 is useful in understanding how the CSI Protocol has been adapted for a carbon offsetting purpose. As this study aims at providing recommendations for an MRV system for sectoral crediting mechanisms, our analysis on the MRV technicalities mainly focuses on NM0302. However, NM0302 lacks implementation experience because it was eventually rejected by the UNFCCC in May 2011. In order to complement this, we also analyse the implementation aspects of the CSI Protocol (e.g. data management, institutional framework). This is justified because NM0302 heavily relies on the CSI's cement plant database obtained through the application of the CSI Protocol (CSI's "Getting the Numbers Right" database, or the CSI GNR database).

NM0302 is applicable to CDM projects reducing GHG emissions from clinker or cement production facilities, be they newly constructed or already existent. Either a single or a combination of mitigation measures can be implemented, such as the substitution of fossil fuels by alternative fuels, the use of alternative raw materials, cement blending, energy efficiency improvements, electricity generation from waste heat recovery and renewable energy, etc. Because of this, this methodology is a good starting point for a MRV system for a whole sector.

The methodology uses a benchmark approach for the assessment of plant-wide emission performance, expressed in CO_2 emissions per ton of clinker or cement (tCO_2e/t clinker or cement). The benchmark is used for both baseline setting and additionality demonstration, but different stringency levels are applied for each of them (i.e. dual benchmark).

The baseline benchmark for existing plants is set as the emission performance at the top 45th percentile of the existing production volume in the region. The baseline performance of new plants is determined by two types of parameters: global and local parameters. The global parameters (specific heat and electricity consumption) are benchmarked at the top 45th percentile of the worldwide production volume of plants built in the last five years. The local parameters (fuel mix, calcinations and clinker to cement ratio) are strongly influenced by local conditions, thus they are benchmarked at the top 45th percentile of the existing production volume in the region. The additionality benchmark for existing and new plants is established in a similar way to the baseline benchmark, with an exception that the top 20th percentile is used as a benchmark stringency level. The benchmarks are updated every year according to the historical trend in the improvement of emission performance recorded in the CSI GNR database.

Leakage is determined by a simple, conservative approach. Emission reductions outside the boundary (e.g. reduced transportation) are not taken into account. Emission increases outside the boundary (e.g. increased transportation) are accounted for by a 5% downward adjustment of the emission reductions. Also, emissions from the cultivation of renewable biomass at a dedicated plantation are taken into account using a default leakage factor of 5 tCO_2e per TJ of biomass used in the project.

The required data are MRVed applying the CSI Protocol and registered in the CSI GNR database. The CSI retained PricewaterhouseCoopers (PwC) to design and manage independently the CSI GNR database to ensure accuracy of the information and adequate safeguards to protect confidential business information (WBCSD 2011a).

Environmental integrity

Completeness: NM0302 and the CSI protocol are highly complete in terms of the coverage of GHGs and emission sources within plants. Only very minor GHGs and emission sources are excluded (e.g. CO_2 emissions from combustion of wastewater injected into kilns, CH_4 and N_2O from kilns). However, as the benchmark parameters are calculated on the basis of the installations included in the CSI GNR database, the benchmark calculation is based on incomplete data of worldwide and regional production. This in turn affects the accuracy of the emission reduction estimations, as discussed below.

Consistency: The MRV systems do not contain any major source of randomness, so emission data should be comparable over time by using the same version of the MRV system. The CSI protocol is currently in its third version. The initial version, published in 2001, was field-tested for two years, reviewed and revised based on comments received from both users and reviewers (UNFCCC 2011a). The changes from the first to the second version were made to improve user-friendliness and adherence to the principles of relevance, completeness, consistency, transparency and accuracy (WBCSD 2005). The main change from the second to the third version was to address the need for accounting CO_2 emissions from on-site power generation, which was practiced in plants owned by new members of the CSI (WBCSD 2011b). The revision history of the CSI protocol shows that the MRV system has been revised to improve completeness and accuracy.

Accuracy: The reasons for the rejection of NM0302 explain where the MRV system lacks accuracy and conservativeness of emission reduction calculation. One key reason is that emission reductions through cement blending cannot be ensured by only monitoring the share of blended cement produced at the level of the project plant, as suggested in NM0302 (UNFCCC 2011a). If a cement plant increases the share of additives in its cement products, the availability of additives in the market decreases and could prevent other cement plants from using additives. In order to account for this leakage effect, one would need to monitor the share of blended cement produced by all cement plants in a relevant market. However, this solution is not feasible because the coverage of the CSI GNR database is still limited in many developing countries.

Conservativeness: The other key reason for the rejection is the deviation of the methodology from the benchmark stringency level stipulated in the Marrakech Accords (the average of top 20% performers). The CDM Methodologies Panel argued that such deviation could be acceptable only if there is no technology that can easily go beyond the benchmark, or if the percentage of plants that can go beyond the benchmark is very small, or if the level of incentives required for moving plants beyond the benchmark is huge as compared to the CDM incentive (UNFCCC 2011a). The methodology developer could not substantiate the choice of benchmark stringency with an analysis of real plant data.

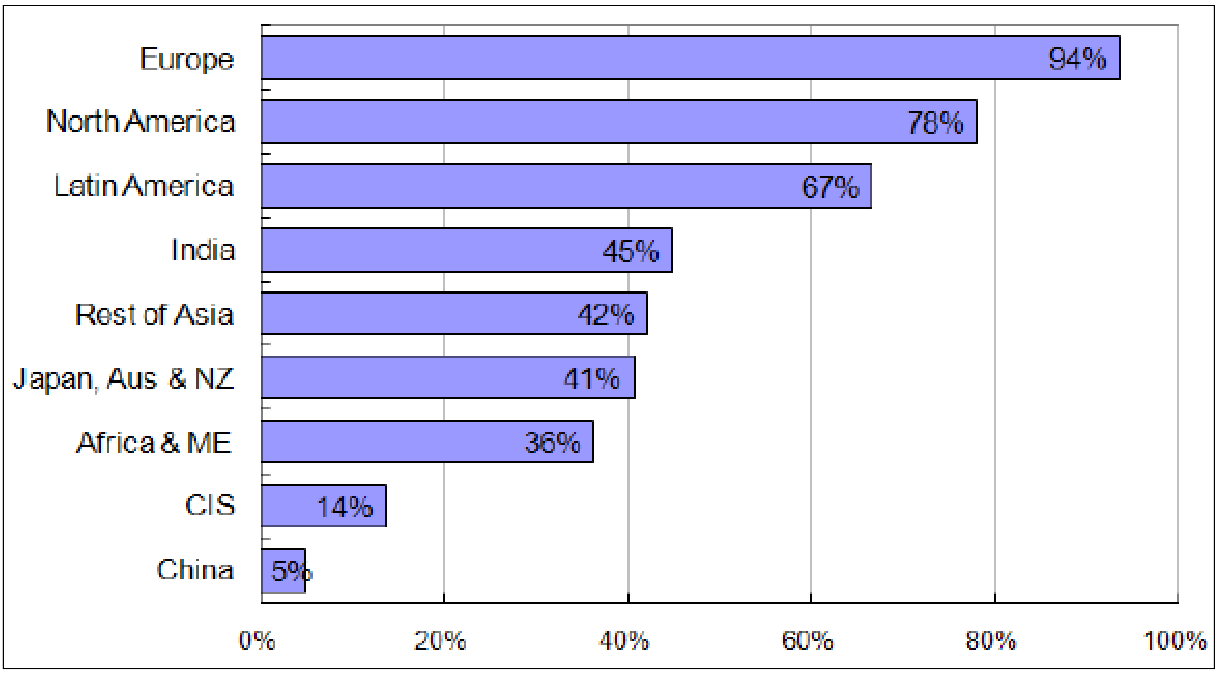
In summary, the environmental integrity of the two cement sector MRV systems analysed can be a concern. Although they are highly complete within plants and consistent, there are two major shortcomings that can lead to an inaccurate (or non-conservative) estimation of emission reductions: the unjustified choice of benchmark stringency and the inadequate treatment of cement blending activities.

Data availability

Data availability: The data required for the application of NM0302 (and the CSI protocol) are available for the following years: 1990, 2000, 2005, 2006, 2007, 2008 and 2009 (WBCSD 2011a). Early data (1990 and 2000) is less reliable than data for later years "since it had to be reconstructed up to 15-year old historical records of cement production, fuel purchases, company ownership, etc." (UNFCCC 2011a). Since 2006, the CSI member companies participating in the CSI GNR database have used an independent third party to verify their data at least every 3 years. Other participants to the CSI GNR database are strongly encouraged to adopt data assurance practices (WBCSD 2011a). As a result, 83% of the 2009 data is verified by independent third parties (WBCSD 2011a).

The CSI GNR database now covers over 900 cement plants, owned by 46 companies. This represents about 26% of the global cement production (WBCSD 2011a). The key challenge is that the CSI GNR database has limited data coverage in key developing countries (e.g. China, India, and the rest of Asia) (see Figure 2).

Figure 2: Regional coverage of cement production in the CSI GNR database in 2006



Source: WBCSD 2009a

Anti-trust laws in Europe, the US and Japan require that collection of business-sensitive information be properly managed to avoid disclosure to competitors (WBCSD 2009a). The CSI GNR database complies with the anti-trust laws and is managed by an independent third party service provider (PwC). Confidential information on individual companies or plants is not disclosed, nor made accessible, and is protected by contractual and data security measures (WBCSD 2011a).

In addition, a Project Management Committee (PMC) was set up to serve as the single contact point for all communications between participants in the CSI GNR database and PwC. The PMC develops the schedule for companies' data submission to PwC and approves or rejects data queries submitted by stakeholders (WBCSD 2011a).

Data to be collected: The following data on emission and energy performance are collected (WBCSD 2011a):

- Specific gross and net CO_2 emissions per ton clinker and cement product;
- Absolute gross and net CO_2 emissions;
- Thermal energy consumption per ton clinker;
- Electric energy consumption per ton cement;
- Fuel mix (fossil fuel / fossil waste / biomass);
- Clinker to cement ratios.

To enable calculation of the percentiles, trend lines and correlations, the following information is also collected (WBCSD 2011a):

- Clinker and cement production volumes;

- Differentiation by grey and white clinker;
- Type of installation;
- Location of installation;
- Nominal production capacity;
- Year of construction.

Transparency

Public availability of emission and additional data: The results of the baseline and additionality benchmark analyses will be made publicly available. Due to the data confidentiality concerns, data obtained for individual plants cannot be disclosed. Thus, the benchmark results will be publicly available only at an aggregate level (i.e. regional level or country level for major producers such as China, India and Brazil) (UNFCCC 2009).

Upon approval by the PMC, other data in the CSI GNR database can be released to anyone, even outside the CSI membership. The PMC will review every data query, evaluating if the information is available and if response to the query would fall within the limits of the confidentiality and anti-trust constraints applicable to the CSI GNR database (UNFCCC 2009).

Cost-efficiency

Cost of MRV system: Existing CDM methodologies for the cement sector address only single measures. However, the implementation of a single measure yields only a limited amount of emission reductions in this sector. Thus, transaction costs, which mainly come from MRV, have been an important barrier for cement projects under the CDM (WBCSD 2009b). Against this background, the holistic MRV approach in NM0302 and the CSI protocol is expected to improve cost-efficiency of MRV systems for the cement sector because it streamlines MRV procedures and the combination of measures can achieve a higher amount of emission reductions.

There is no published data on the cost-efficiency of the application of NM0302 or the CSI protocol. However, the fact that over 900 cement plants have voluntarily participated in the CSI GNR database indicates that the application of the CSI protocol does not result in unreasonably high costs.

Institutional framework

Responsible authorities: On top of the CDM institutional framework described above under 4.2.5, the CSI GNR experience shows that it is indispensable to have an independent third party manage business-sensitive data. The database manager needs to ensure non-disclosure of confidential information and compliance with anti-trust laws. It is also helpful to have a body that is authorised to make decisions on data submission schedules and on disclosure of data to stakeholders.

The existing bodies (PwC, the PMC, independent auditors) have addressed these tasks since the start of the CSI GNR initiative in 2006. Thus, there is already a functioning institutional framework for the application of the MRV system.

Transferability

The CSI protocol has already been applied to plants in developing countries. Thus, the MRV system is in principle transferable to these countries. However, the limited coverage of the CSI GNR database indicates that there are some practical reasons why certain developing countries have not participated in the MRV initiative.

In the case of China, one of the key reasons for the limited data coverage is related to its cement market structure. The participants to the CSI GNR database are usually large, multinational companies. In contrast, the Chinese cement market is dominated by small- to medium-sized domestic companies, and the multinational CSI GNR participants are not present in the Chinese market (Müller 2011). Moreover, the smaller size of Chinese cement producers makes it more difficult to have an internal audit team to assure the quality of emissions and energy data collected (Müller 2011), which is an essential requirement for the participation in the CSI GNR database (WBCSD 2011a).

The MRV system is ready for use in any developing countries. However, the Chinese case shows that its implementation is easier in developing countries where there is a concentrated cement market with plants owned by large companies.

4.3.4 Buildings under the CDM

The methodology AM0091 "Energy efficiency technologies and fuel switching in new buildings (version 1.0.0)" is applicable to CDM projects that implement energy efficiency and/or fuel switching measures in new building units in the following categories:

- Residential: single-family, multi-family
- Commercial: office, hotel, warehouse, mercantile, etc.
- Institutional: education, public assembly, health care, etc.

A building unit is defined as a distinct space in a building allotted to a specific user, which can be either a tenant or owner. If a building is used by a single tenant/owner, the building unit is equal to the entire building.

A single benchmark is applied to baseline setting and additionality demonstration. That is, the stringency of baseline and additionality benchmarks is set at the same level. Thus, any emission reductions achieved beyond the benchmark are deemed additional. Only in the case fuel switching measures are implemented, additionality of these measures needs to be demonstrated by an investment analysis.

The benchmark is expressed in emissions per gross floor area (tCO_2e/m^2). Its stringency is set at the average emission performance of the top 20% performer building units in similar circumstances to project building units, which are built and occupied in the last five years. The similarity in circumstances is assessed by geographical location, climatic conditions, socio-economics status of building occupants, building unit type and size, and occupancy patterns.

The methodology evaluates the building emission performance at an aggregate (building unit) level. Therefore, one does not have to separately monitor every single measure implemented in each building unit (e.g., air-conditioners, compact fluorescent lamps, multi-glazed windows). The methodology can account for emissions from the consumption of electricity, fossil fuels, and chilled/hot water as well as refrigerant leakage (e.g. through refrigerators and air conditioners). The comprehensive coverage of efficiency measures and emission sources provides flexibility in choosing mitigation measures according to specific requirements of building units (Michaelowa & Hayashi *forthcoming*).

Environmental integrity

Completeness: Among the approved CDM methodologies available for the building sector, AM0091 has the most comprehensive coverage of GHGs and emission sources. The methodology monitors the total energy consumption of building units, without looking into the energy consumption of each energy efficiency measure implemented. As opposed to most other methodologies focusing on specific mitigation measures (e.g. efficient lighting, refrigerators), this technology-neutral approach has the advantage of accommodating a wide range of mitigation measures. The only major emission sources excluded from this methodology are the consumption of biomass and biogas. This is because complex procedures are necessary for calculating baseline and leakage emissions for these fuels. In order to avoid a possible emission increase from these emission sources, the methodology is made applicable only if the project building units do not consume biomass and biogas.

Accuracy and conservativeness: The technology-neutral approach requires a compromise in accuracy in the emission reduction calculation. As MRV is performed only at the building unit level, it cannot evaluate which mitigation measures result in how much emission reduction (i.e. weak causality between the measures and emission reduction). However, the stringent benchmark level set in the methodology (the average of the top 20% performers) would very likely result in a conservative estimation of emission reductions. Thus, the conservative benchmark acts as a safety valve for the environmental integrity. In addition, the methodology requires all measurement equipment to be calibrated according to relevant industry standards. The emission reduction estimates are conservatively adjusted for the measurement uncertainty as well as errors associated with building unit sampling.

Consistency: The methodology does not contain any major source of inconsistency. The methodology was approved in June 2011 and has not been revised since then. Thus, it is not possible to assess consistency in methodology revisions specifically for AM0091. In general, however, approved CDM methodologies are revised to improve conservativeness and accuracy of emission reduction estimation methods, or to improve the usability of the methodologies (UNFCCC 2010).

In summary, the methodology maintains a high level of environmental integrity. It has a comprehensive coverage of GHGs and emission sources, and provides proper justification for the exclusion of biomass and biogas usage. The technology-neutral benchmark approach needs a compromise in the accuracy of emission reductions estimation. But the conservative benchmark is expected to safeguard the environmental integrity. Though the methodology is yet to be revised since its initial adoption, its consistency can be expected to be high.

Data availability

Data to be collected: The benchmark approach applied in AM0091 requires extensive data. The key data for emission reduction calculation are gross floor area of building units (activity data), and energy consumption and refrigerant leakage (emission data).

Data availability: The gross floor area data need to be collected every third year from a sample of building units that is used for the calculation of baseline and project emissions. The data can be obtained from building plans or on-site measurement, if the former is not available. In developing countries, the data are not readily available. For example, in Abu Dhabi, the United Arab Emirates (where the CDM project underlying the development of AM0091 is situated), a building database is available with the Land and Real Estate Division of the Abu Dhabi Municipality. However, this database only has data about land area (plot plan) and designs, but not for the total gross floor area of building units. Thus, the data must be collected by building surveys (Prakash 2010).

The energy consumption data (electricity, fossil fuels and chilled/hot water) need to be collected every year. This is because annual variation in climatic conditions has a large impact on the building energy consumption. Such data are easier to obtain if the energy is supplied by local utilities and appropriate metering systems are implemented. This is likely the case with grid electricity supply and distribution of chilled/hot water through a district system. However, if the energy is purchased or generated individually by building unit occupants, it would be challenging to collect energy consumption data directly from the occupants (e.g. through energy purchase bills). This is more likely to be the case with captive electricity, fossil fuels (e.g. LPG, charcoal) and chilled/hot water supplied by individual systems within building units or by a central system captive to buildings. The refrigerant leakage data are to be collected every third year. But, if the actual monitoring is difficult, conservative IPCC default factors are allowed to be used.

Data confidentiality is less of a concern for the building sector than it is for the power and cement sectors. This is because building unit occupants, the key data source, are not market competitors as in the other sectors. The confidentiality issue may arise with the socio-economic data of building unit occupants, which are necessary for the identification of baseline building units. The socio-economic status can be measured by income levels of the occupants or property prices of the building units. Census data could be used if they contain income level information. However, such data are uncommon in developing countries. The methodology thus allows for the use of property prices as a proxy for income levels, which can be obtained through a real estate market survey without raising confidentiality issues.

Transparency

Public availability of emission and additional data: The methodology requires transparent documentation of all the steps for the calculation of baseline/project emissions, including a list of the baseline/project building units identified as well as the relevant data used for the calculation for the baseline/project emissions.

No CDM project has been submitted applying the methodology. Therefore, it remains to be seen to what extent project developers and validators fulfil the requirement of transparent documentation. But, compared to other carbon offset mechanisms, the CDM generally maintains a very high standard of transparency in the project data documentation. All key, non-confidential data are usually made publicly available, and confidential data, though not made publicly available, are communicated to the UNFCCC through DOEs for their assessment for project registration and issuance of CERs.

Cost-efficiency

Cost of MRV system: The methodology requires extensive data for the emission reduction calculation. Most of the key data are not readily available in developing countries. Furthermore, the methodology requires actual monitoring of data and offers only a limited number of default factors (e.g. refrigerant leakage). This is because building energy consumption patterns are heavily influenced by various local conditions (e.g. climate, geographic location, building size, occupancy patters). As it is difficult to establish widely applicable default factors, the methodology currently does not offer much scope for reducing MRV costs. Thus, MRV costs for the building sector would likely be very high. The methodology however allows to reduce costs by permitting the use of sampling in the data monitoring process.

Another option for reducing MRV costs lies in the possibility of proposing a Programme of Activities (PoA). This can be achieved by allowing for bundling of an unlimited number of CDM Project Activities (CPAs), and by simplifying procedures for registration of CPAs (CPAs can be added to a PoA without assessment by the UNFCCC) and for verification of a PoA (one could opt for verification of a sample of CPAs). PoAs are especially relevant to the building sector because it involves a number of small and dispersed emission sources.

Institutional framework

Responsible authorities: In applying AM0091, key steps of the monitoring and reporting stages are (1) identification of baseline building units for benchmarking, and (2) monitoring of energy consumption of the baseline/project building units. The institutional framework required for these steps are described below. The verification stage is addressed by the regular CDM bodies such as DOEs and the CDM Executive Board. Thus, it is not discussed below.

The identification of baseline building units requires building surveys for collecting the necessary information on building unit characteristics. The data collection effort can best be built on the existing database and data collection procedures of local government bodies responsible for issuing permits to new building constructions. Such bodies may have better access to income level information in census data, if such are available. If the income level data are not available, the government bodies need to work closely with real estate agencies regularly collecting building property price information.

The monitoring of building energy consumption requires a close collaboration with local utilities supplying electricity, fossil fuels and chilled/hot water to baseline/project building units. Their regular metering procedures can be adapted to the methodology application (e.g. use utility bills). In the case the energy is purchased or generated in a decentralised manner, the energy consumption data need to be collected directly from building units occupants. There is no existing body exercising such data collection, thus a new institution needs to be created for this building survey.

Transferability

The methodology is suitable for advanced developing countries that have the capacity to implement the rather demanding MRV system, and where building units consume modern energy carriers.

The implementation of the MRV system is easier if local utilities have already implemented appropriate metering of building energy consumption, and records of new building constructions are maintained centrally. It is also helpful if a census survey is carried out regularly on income levels. Otherwise, there should be a functional real estate market so that building property prices can be obtained.

It is best if the building units consume modern energy carriers (e.g. electricity) because they are usually distributed by central energy suppliers and MRV of their consumption is easier. In addition, the methodology currently does not allow for the use of biomass and biogas. As they are essential energy carriers for less advanced developing countries, the methodology requires a revision to be applicable to these countries.

4.4 Proposals for MRV of new market-based mechanisms

This chapter describes the main institutional and data requirements for a MRV within NMBM. The proposals are based on the analysis of existing systems (CDM, EU ETS) in the chapters before and the existing literature. Taking our criteria from the introduction the main requirements for a MRV system are environmental integrity (completeness, accuracy and consistency of data), transparency and cost-efficiency.

4.4.1 Institutional requirements

A well-functioning MRV system will need a series of domestic (host country) and international institutions. We describe here the *minimum of institutions needed for a credible MRV system* within NMBM, while we do *not* discuss the institutions needed for the implementation of new market-based mechanisms (e.g. planning and implementing policy measures, and translating the price signal to the private sector).

In-country institutions

In NMBM, host country institutions will have a central role in monitoring and reporting, while they may also participate in verification. The role of domestic institutions is similar to that in the EU ETS and more important than in the CDM case (because of the policy-nature of NMBM and the sectoral scale). Each host country will need at least a national coordinating entity (NCE) and regulations, and in many cases also technical intermediaries and national verifiers.

- A **National Coordinating Entity (NCE)** is needed for coordinating the baseline assessments, national monitoring and reporting, reviewing the data quality, and approving the sectoral programme proposals as well as monitoring reports before sending them to international institutions. The NCE will help to avoid overlaps of different sectoral programs, coordinate all in-country institutions (see the experience of the EU ETS and the cement sector) and assure consistency of data from different sources and with the national GHG inventory. Incorporating the NCE in the CDM's Designation National Authority (or the other way round) is not necessary but has the advantage of sharing information and building on existing capacity.
- **Regulations and administrative procedures** (here also seen as institutions) are also required for a MRV system to function. New market-based mechanisms will cover the emissions of multiple private (and public) entities, which have to be obliged to monitor

and report their emissions (Aasrud et al. 2010; Duggan 2010). The way this is achieved (only national or also subnational, soft or hard rules) will be country- and sector-specific.

- **Technical Intermediaries (TIs)** will in most cases also be needed because of several reasons. First, some of the emitting entities will not have the capacity to monitor and report their emissions on their own (see the experience of the building sector in the CDM). Therefore, local governments, utilities or consultants will have to collect data. Second, TIs may be needed in aggregating local data and assuring data quality, as the NCE itself may not have the outreach or capacity to assure accurate and complete data country-wide. Depending on the national circumstances, the TIs can be private and/or public, split in many institutions or unified in one body.
- **National Verifiers** will be most important in the case of decentralized governance of NMBM, where only generic guidelines and rules are decided on the international level, while concrete MRV is undertaken at the national level (and only loosely reviewed on the international level). As learned from the EU ETS and the cement sector, independence of theses verifiers is needed to ensure confidentiality.

In most countries and for all described institutions, substantial capacity has to be built for the MRV system to operate smoothly (see Schneider and Cames 2009; Aasrud et al. 2010, Duggan 2010; Fujiwara et al. 2010; World Bank 2010). The Table below shows that a pre-assessment needs to be undertaken before capacity is built and systems have to be tested before implementation. These three steps are interactive; learning-by-doing will enable capacity building over the long term. We can derive from lessons under the CDM that capacity building programmes have to be coordinated and linked to concrete programme/project proposals to increase effectiveness (Okubo & Michaelowa 2010: Stadelmann & Michaelowa 2011).

Capacity building area	Specific steps
Technical capacity building	Pre-assessment of data requirements, data availability and collecting capacity (Schneider & Cames 2009; Duggan 2010; Fujiwara et al. 2010; World Bank 2010)
	Capacity building on collection, reporting and verification of reliable data (Duggan 2010; Fujiwara et al. 2010)
	Testing of MRV systems (Aasrud et al. 2010; Fujiwara et al. 2010)

Source: Extracted and adapted from a table in Stadelmann & Michaelowa (2011)

International institutions

At the international level, institutions are needed to review the proposals of sectoral schemes and, in the case of an internationally coordinated system, to verify baselines, emissions and to issue credits. Learning from the CDM, we suggest that there is at least a governing body, a technical body, an administrative support unit, while verification may be conducted by independent verifiers.

- A **governing body** (similar to the CDM Executive Board) should decide on politically sensitive issues, such as the main MRV guidelines. In the case of an internationally coordinated governing system, as lined out by the EU in their proposal of a "Special Supervisory Board" (UNFCCC 2011c), this body will also approve methodologies, sectoral programme documents (including crediting baselines, programme design) and verified monitoring reports, and will issue credits. In the case of an uncoordinated system, the body will just provide an analysis of reported information. While it would be theoretically desirable to have an independent non-political body, the politically sensitive nature of decisions will in the end require balanced representation of experts from developed and developing countries. Learning from the CDM, it is important that the governing body is professionalised once the workload increases. It can lower its workload by focusing on politically sensitive decisions (e.g. crediting baselines, see Schneider & Cames 2009), while delegating technical analysis to other bodies.

- **Technical bodies:** The technical bodies will carry out the technical work that exceeds the capacity of the governing body (similar to the CDM Methodology Panel, Accreditation Panel, Small Scale Working Group and Registration & Issuance Team). In an internationally uncoordinated governing system, the technical bodies will mainly elaborate guidelines and analyse the information on NMBM submitted by Parties (e.g. MRV system, achieved reductions, traded credits), while in an coordinated governing system the technical bodies will also elaborate baseline and MRV methodologies, and assess critical information in programme documents (e.g. crediting baselines). De Sépibus & Tuerk (2011) argue that programme-specific analysis will have to be undertaken also on the ground, in interaction with national stakeholders, to better understand the data and country circumstances.
- **Accredited verifiers** (similar to DOEs in the CDM) will probably be needed in the case of an internationally coordinated governance system, as assessing all information will exceed the capacity of the technical bodies. Two lessons on independent verifiers can be learned from the CDM: First, they should only be responsible for data that is easily verifiable (e.g. data on fuel use, calibration of measurement equipment, compliance with procedures) while politically and technically challenging tasks (e.g. assessing a counterfactual baseline) have to be undertaken by technical bodies under political guidance. The second lesson is that verifiers should not be directly appointed and paid by the sectoral programme owner (the host country) but appointed by international bodies (see e.g. Lund 2010).
- An **administrative support unit** would receive, stores and forward documents, in order to facilitate the work of the governing and the technical bodies.
- Last but not least, **overarching institutions** are needed to integrate the units generated by NMBM into a broader GHG accounting framework. While the Kyoto Protocol encompasses those institutions, including the international carbon unit, the international transaction log (ITL) for credits, and national registries for emission allowances, it is unclear if these institutions will continue to exist as the fate of the Kyoto Protocol is uncertain and the negotiations under the UNFCCC do not provide clear signals whether Kyoto institutions will be maintained. For assuring an environmentally integer MRV system for NMBM, the existing institutions have to be continued and a sound link to new MRV elements, including International Consultation and Analysis (ICA) as well as MRV of NAMAs has to be established (de Sépibus & Tuerk 2011).

- Additionally, an **appeal body** may be required, in order to enable stakeholders to appeal against decision of the governing body (see experience within the CDM)

4.4.2 Data requirements

Data required for environmental integrity

NMBM can build on the experience of the CDM and EU ETS, when defining the type of data needed. The minimum information required in any sectoral programme document should encompass the following;

- Definition of scope of sector, covered greenhouse gases and installations (Aasrud et al. 2010)
- Past and current emissions, including data sources, methodologies and tools; link to inventory data
- Projected business-as-usual emissions and assumptions (e.g. growth, technological change)
- Proposed sectoral policies and measures, including expected GHG impact and financing
- Proposed crediting baseline (in the case of sectoral crediting) or emission cap and allocation (in the case of sectoral trading)

Information required in any monitoring report should encompass the following;

- Measured emissions, including data sources, methodologies and tools; link to inventory data
- Implementation of sectoral policies and measures, estimated GHG impact and financing
- Calculation of emission reductions (compared to baseline)

Methodology approach

The information requirements listed above are just broad data categories. In practice, each sector or sub-sector will require methodologies on the detailed type of data needed, guidance for data collection and formulas for combining the numerous variables. These methodologies will have to be updated or revised once better evidence for emission calculations is present. For this substantial challenge of setting up and revising methodologies, NMBM can build on existing methodologies of the CDM, but the challenge will be to adapt the largely single-measure and project-based methodologies to holistic ones that can assess emissions and baselines of entire sectors and can accommodate several measures. The CDM methodologies closest to sectoral methodologies are the ones in the power, cement, and building sector. In addition, lessons can be drawn from the EU ETS, mainly in terms of emissions data monitoring in industrial sectors and in terms of determining sectoral benchmarks.

Accuracy versus flexibility

We have set out in the beginning that any credible MRV system should ensure completeness, accuracy and consistency of data, in order to warrant environmental integrity. However, we can learn from the EU ETS and the CDM that highest accuracy sometimes has to be traded for practicability and flexibility, but should not be traded for conservativeness. As the question of accuracy vs. flexibility/practicability in NMBM will certainly come up in the future, the governing body will be better off considering this from the beginning. We propose the following rules of thumb, derived from lessons in the EU ETS;

- **Flexibility at the beginning**: to trigger early deployment of NMBM and enable capacity building and learning, NMBM should only demand full accuracy and completeness if the host country has enough capacity. The tiered approach for accuracy of data as applied in the case of the EU ETS is an interesting tool to be applied in NMBM, which may also enhance cost-efficiency of MRV systems. In order to create financial incentives from the outset, NMBM should receive fully fungible units right from the beginning, but to ensure conservativeness part of these credits should be cancelled or not issued at all.
- **Strict rules in the mid-term**: Some years after NMBM have started, the governing body should try to tighten the rules and ensure full environmental integrity of NMBM, in order to enhance credibility and ensure net emission reductions (see Michaelowa 2009 for the case of the CDM). This phase will also allow for testing the level of environmental integrity that is achievable.
- **Flexibility in the long term:** After 7-10 years of operation, existing NMBMs will have to consider the lessons learned from the pilot phases: which data is absolutely required, where can more flexibility be allowed? Are there still loopholes in environmental integrity? A reform of NMBM will probably be required, similar to the reforms after Phase I and II of the EU ETS.

Confidentiality

Particularly the Cement Sustainability Initiative but also discussions in the aluminium and steel sector have shown that confidentiality of industry data can be a hurdle for data collection. Therefore, only accredited verifiers and technical bodies should be allowed to view and analyse installation-level data after having signed confidentiality clauses, while only showing aggregate data to the public. This certainly contradicts full transparency, which may lower political acceptance. A fine balance between confidentiality and transparency has to be found.

4.5 Conclusions

Accurate monitoring, reporting and verification (MRV) of emission reductions is an essential element for ensuring environmental integrity of new market-based mechanisms (NMBM), which have the double goal of better integrating developing countries in the global carbon market and enabling cost-effective mitigation for industrialised countries. The creation of a sound MRV system can be accomplished by ensuring completeness, accuracy and consistency of data through the setup of both domestic and international institutions and detailed but realistic rules for data collection.

The shaping of MRV systems for NMBM can draw lessons from three existing systems: First, the Clean Development Mechanisms (CDM) as the only established carbon market mechanism involving developing countries. The CDM can provide a good starting point with its established methodologies, rules and institutions but the framework has to be adapted when moving from the project to the sectoral level (e.g. the role of national MRV institutions will be more important). Second, the European Union Emission Trading Scheme (EU ETS) as the largest and technically most advanced ETS worldwide provides important lessons for the setup of institutions and MRV of data at the sectoral and national level (e.g. flexibility needed, tiered approach of data accuracy, role of national institutions). However, the availability of data and capacity for accomplishing MRV functions will be different in developing countries, and the EU ETS is more similar to some NMBMs (sectoral trading) but rather different to other (sectoral crediting). Third, new data collection, reporting and verification systems for developing countries are being currently negotiated: MRV of internationally supported Nationally Appropriate Mitigation Actions (NAMAs), International Consultation and Analysis (ICA) of non-supported NAMAs and procedures for biennial update reports including national inventories. While all these systems are not yet implemented, the MRV of NMBM should be consistent with these systems to avoid double counting and overlaps.

From the analysis of the EU ETS and CDM methodologies covering data of whole sectors (buildings, cement and power), we derive the following institutional and data requirements for a credible MRV system of new market-based mechanisms:

Regarding institutions, various national and international institutions will need to be created. Particularly the national ones will be important, very similar to the EU ETS, as data from whole sectors has to be monitored and reported. We assume that at least a national coordination entity and national regulations are required. In addition, technical intermediaries for data collection and aggregation as well as national verifiers may be needed. Most institutions will require substantial capacity building, which should be combined with concrete sectoral programmes and start as early as possible.

At the international level, we propose to establish an institutional architecture that is very similar to the one of the CDM: a governing body taking politically sensitive decisions, several technical groups as well as an administrative support unit assisting the governing body, and internationally accredited verifiers, who are responsible for time consuming tasks and easily verifiable data. The concrete role of bodies will very much depend on the post-2012 architecture of the climate regime. In the case of an internationally more coordinated MRV system, the technical bodies will do detailed work on methodologies, rules and approval of verifiers, while their tasks would be limited to elaborating general guidance and analysing (or reviewing) submitted information of national NMBM in a decentralized system. Und a lesser coordinated approach, the governing body would only be approving the work of the technical bodies, while under the internationally coordinated approach the governing body has to take much more important decision on caps and crediting baselines.

Regarding data requirement, we assume that proponents of a sectoral programme would have to submit at least information on emission coverage, current and projected emissions, proposed caps or crediting baselines, planned policies and measures, expected impact and funding, as well as actually measured emissions. Detailed data requirements would have to be elaborated in sector-specific methodologies, which can partly build on methodologies and data in the CDM, particularly in the cement, building and power sector. Experience from the CDM and the EU ETS illustrates that an encompassing data collection system can create substantial transaction costs. In order to encourage the short-term implementation of NMBM, flexibility in terms of tiered data requirements may be needed, which however need to be strengthened with increasing experience and hence data availability. While providing flexibility is key also to reduce transaction costs, conservativeness of emission reduction estimations should not be com-promised. Finally, confidentiality of data will be a hurdle in competitive industries, so a system to balance transparency and confidentiality has to be elaborated.

The most important conclusion is that MRV of NMBM will very much depend on the outcome of the climate negotiations, mainly whether NMBM are governed internationally coordinated or not. An internationally coordinated MRV system would more easily ensure environmental integrity because of common rules and accounting. However, a rather uncoordinated system is not unlikely given the current negotiations. Therefore, more analysis has to be done on institutions and MRV guidelines required to ensure a minimum of environmental integrity of NMBM in the case of an internationally uncoordinated regime. De Sépibus & Tuerk (2011) have made some first attempts by emphasising the importance of international reviews of NMBM documents in the case of uncoordinated governance.

4.6 References

Aasrud, A.; Baron, R.; Karousakis, K. 2010: Market readiness: building blocks for market approaches. Organisation for Economic Co-operation and Development / International Energy Agency, Paris

Breidenich, C.; Bodansky, D. 2009: Measurement, reporting and verification in a post 2012 climate agreement. Pew Center, Arlington

de Sépibus, J.; Tuerk, A. 2011: New Market-based Mechanisms post-2012: Institutional Options and Governance Challenges when Establishing a Sectoral Crediting Mechanism. Climate Economics at the NCCR Climate, Research Paper 2011/06. University of Bern, Bern

Duggan, J. 2010: Preparing readiness for market instruments. Presentation at the workshop on "Mitigation Action and the role of market instruments – bridging readiness gaps", March 9 and 10 2010, in Seoul. http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Preparing_Readiness_for_Market_Instruments_Korea_March_2010.ppt

Ellis, J.; Moarif, S. 2009: GHG mitigation Actions: MRV issues and options. OECD and IEA, Paris

European Environment Agency 2006: Application of the emissions trading directive by EU Member States. EEA Technical Report No. 2/2006, Copenhagen

European Union 2004: Commission Decision of 29 January 2004 establishing guidelines for the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council. In: Official Journal L 95, 26.02.2004, http://eur-lex.europa.eu/LexUriServ/site/en/oj/2004/l_059/l_05920040226en00010074.pdf

Fransen, T. 2009: Enhancing today's MRV framework to meet tomorrow's needs: The role of national communications and inventories. Working Paper. World Resources Institute, Washington, D.C.

Fujiwara, N.; Egenhofer, C.; Georgiev, A. 2010: Getting Started Now: Capacity Building for the Data System Foundations of Sectoral Approaches to Climate Change. CEPS Special Report/April 2010. Centre for European Policy Studies, Brussels

Hermann, H. 2010: Benchmarking in the EU. Presentation at Symposium on understanding the value of benchmarking, Seattle, 19 May 2010. Öko-Institut, Berlin

Jung, M. et al. 2010: Nationally appropriate mitigation actions: Insights from example development. Ecofys

Lund, E. 2010: Dysfunctional delegation: why the design of the CDM's supervisory system is fundamentally flawed. Climate Policy 10: 277-288

McMahon, H.; Moncel, R. 2009: Keeping track: national positions and design elements of an MRV framework. Working Paper. World Resources Institute, Washington, D.C.

Michaelowa, A. 2009: Interpreting the Additionality of CDM Projects: Changes in Additionality Definitions and Regulatory Practices over Time, in: Freestone David, Streck Charlotte (eds) Legal aspects of carbon trading. Oxford University Press, Oxford, pp. 248–271

Michaelowa, A. 2011: Rule consistency of grid emission factors published by CDM host country authorities. Report commissioned by CDM Watch. Perspectives, Zürich.

Michaelowa, A.; Hayashi, D. 2011: Waking up the sleeping giant – How the new benchmark methodology can boost CDM in the building sector. Trading Carbon Magazine, *forthcoming*

Müller, N. 2011: Discussion on the coverage of the CSI GNR database in China, Personal communication by phone, 12 September 2011

Okubo, Y.; Michaelowa, A. 2010: Effectiveness of subsidies for the Clean Development Mechanism: Past experiences with capacity building in Africa and LDCs. Climate and Development, 2(1): 30-49

Prakash, S. 2010: Discussion on data availability for the NM0302 application in Abu Dhabi, the United Arab Emirates, Personal communications by emails in September 2010

Schneider, L.; Cames, M. 2009: A framework for a sectoral crediting mechanism in a post-2012 climate regime. Report for the Global Wind Energy Council. Berlin

Stadelmann, M.; Michaelowa, A. 2011: How to enable the private sector to mitigate? Building capacity and creating an enabling environment for low-carbon business activities in developing countries. Working Paper. Climate Strategies, Cambridge

UNFCCC 2007: Bali Action Plan, in: Report of the Conference of the Parties on its thirteenth session, held in Bali from 3 to 15 December 2007. Addendum. Part Two: Action taken by the Conference of the Parties at its thirteenth session. FCCC/CP/2007/6/Add.1

UNFCCC 2009: CDM Meth Panel's preliminary recommendation to NM0302, http://cdm.unfccc.int/filestorage/9/F/4/9F458E1NKHGJRTV6AZM2O7UPSQWXL3/Feedback%20on%20preliminary%20recommendation%20for%20NM0302.pdf?t=d2p8bHJkYmszfDD_obIsFhAg3CP-i2_FTbIP

UNFCCC 2010: EB43 Report Annex 2 – Procedure for the submission and consideration of requests for revision of approved baseline and monitoring methodologies and tools for large scale CDM project activities (version 1), http://cdm.unfccc.int/Reference/Procedures/meth_proc06_ver01.pdf

UNFCCC 2011a: CDM Meth Panel's final recommendation to NM0302, http://cdm.unfccc.int/UserManagement/FileStorage/CTFSBGVQHMPE0981D2K7I4A5LOJN3U

UNFCCC 2011b: AM0091 - Energy efficiency technologies and fuel switching in new buildings (version 1.0.0), http://cdm.unfccc.int/methodologies/DB/WTEB6W8MP4BQZXOIBS1FO9KXP45C9R

UNFCCC 2011c: Ad Hoc Working Group on Long-term Cooperative Action under the Convention,Views on the Elaboration of Market-Based Mechanisms, Submissions from Parties, http://unfccc.int/documentation/documents/advanced_search/items/3594.php?rec=j&priref=60000617

WBCSD 2005: The Cement CO_2 Protocol – CO_2 accounting and reporting standard for the cement industry (version 2), http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=MTU5MjQ

WBCSD 2009a: Cement industry energy and CO_2 performance – "Getting the Numbers Right", http://www.wbcsd.org/DocRoot/IV5ZFD9dESJbSb3h7kxM/csi-gnr-report-withlabel.pdf

WBCSD 2009b: WBCSD-CSI - Call for inputs on the reasons for no or low application of approved meths in CDM projects, http://cdm.unfccc.int/public_inputs/2009/appl_meth/index.html

WBCSD 2011a: Global Cement Database on CO_2 and Energy Information, http://www.wbcsdcement.org/index.php?option=com_content&task=view&id=57&Itemid=118

WBCSD 2011b: The Cement CO_2 and Energy Protocol – CO_2 and energy accounting and reporting standard for the cement industry (version 3), http://www.wbcsdcement.org/pdf/tf1_co2%20protocol%20v3.pdf

World Bank 2010: A Capacity Building Fund for Market Readiness. Brainstorming. Presentation at the workshop on "Mitigation Action and the role of market instruments – bridging readiness gaps", March 9 and 10 2010, in Seoul, Republic of Korea. http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Capacity_building_fundconcept_March_9_10.pdf, accessed 20th March 2011

5 Setting baselines for the new market mechanism: Examples from the power, cement and buildings sectors

Work package 4, by Paula Castro, Daisuke Hayashi, Axel Michaelowa (IPZ), Ralph Harthan, Martin Cames (Öko-Institut), 30 November 2012

The establishment of a new market-based mechanism (NMBM) for the climate change regime post-2012 was decided upon in December 2011 during COP17 in Durban, with a view to defining its modalities and procedures during 2012. One of the crucial design elements to consider when establishing market-based mechanisms is the definition of a reference scenario or baseline on the basis of which emission reductions are calculated. Whereas for project-based mechanisms, emission reductions were historically calculated as the difference between the baseline and project emissions, for NMBMs their calculation will start from a level that is lower than the baseline in order to generate global emission reductions. We hence differentiate between the baseline emissions level and the emissions target or crediting threshold. This paper considers past experience in setting reference scenarios, from both the academic literature and existing market mechanisms, to draw lessons for the NMBM.

While the exact nature of the NMBM has not yet been defined, it is supposed to stimulate mitigation "across broad segments of the economy", as agreed in Cancun in 2010. In this study, we thus focus on market-based mechanisms that seek to target a whole economic sector, such as sectoral trading or sectoral crediting.

Under sectoral trading, an emissions target is set for a specific sector within a country, and tradable emission allowances up to that target are issued and allocated to the sector's installations ex ante. Installations need to implement measures to reduce greenhouse gas (GHG) emissions up to the level of their allocated allowances or else buy more allowances in the market[11]. Under sectoral crediting, a crediting threshold is set for a specific sector within a country. The government provides incentives to the activities within the sector to reduce emissions and meet the crediting threshold. The emission levels of the sector are then monitored during a crediting period. Emission credits corresponding to the amount of reductions achieved below the threshold are issued ex post. These credits can be traded in the international market and the revenue can be used for financing policies and measures or for rewarding those installations that contributed to the reductions. If the crediting threshold is not met, no penalty is applied.

Under both approaches – sectoral trading and sectoral crediting – a baseline needs to be defined upfront below which the allocation of allowances or the crediting threshold is set.

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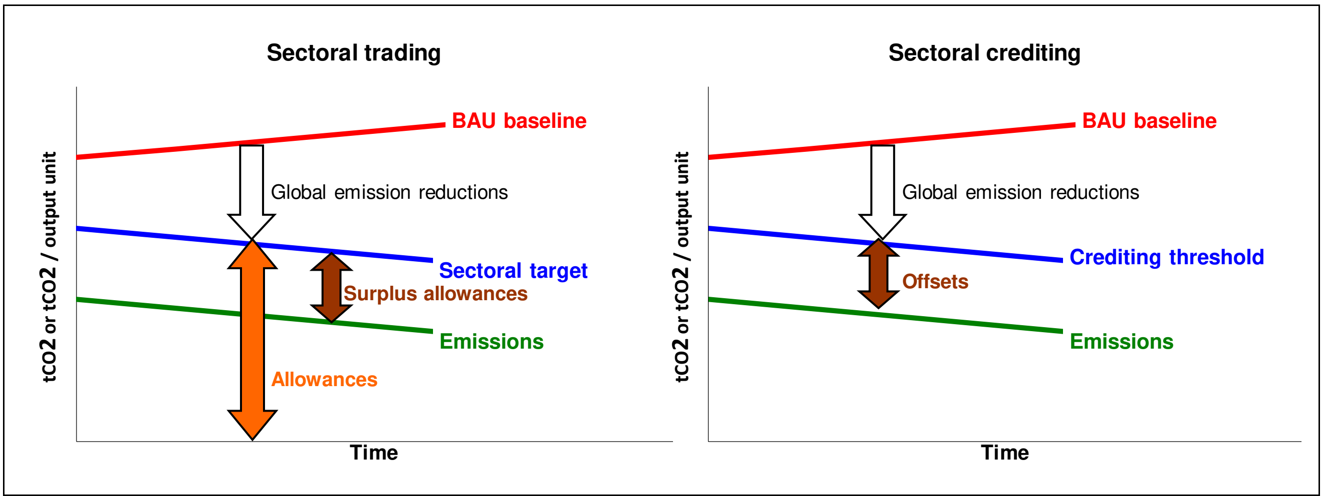
[11] In principle, sectoral trading does not need to rely on an intra-sectoral emissions trading scheme as depicted here. The allowances for the whole sector could be kept and managed by the government, which would implement applicable policies and measures to reach the sectoral target. In this case, if the target is not met, it would be up to the government to buy more allowances in the international market and to penalise those installations within the country which failed to contribute sufficiently to emission reductions. In this paper, however, we focus on sectoral trading as the design that more easily transfers responsibility and a carbon price signal to the private sector.

Definition:

A *baseline* is the expected development of GHG emissions over time under the assumption that from a certain point in time no new mitigation measures would be undertaken. It constitutes a reference scenario with respect to which the emission targets or the crediting thresholds are set. The baseline should predict business-as-usual (BAU) as accurately as possible. Approaches for determining the baseline could range from simply drawing a flat line from status quo emissions (if no other reliable information is available) to complex scenarios which take into account all covered activities, their estimated emission performance, their vintage and expected economic lifetime as well as projections of demand and socio-demographic indicators, etc.

See Figure 3 for a schematic representation of the relationship between BAU baseline, emissions target or threshold, actual performance, and credits or allowances obtained.

Figure 3: Baselines under the new market mechanism



Source: Adapted from Aasrud et al. (2010)

Thus, the way in which this baseline is set – and the way in which the stringency of the sectoral target or crediting threshold is defined – plays a crucial role for determining how many emission reductions are credited or allowances allocated. If the baseline predicts higher emission levels than those generated by the actual business-as-usual development, and the target/threshold is lenient, this may result in overallocation of allowances or crediting of reductions that are not "real". Therefore, both baseline emission levels and stringency of the target or crediting threshold need to be considered when assessing the environmental integrity of the mechanism.

In this paper, we contribute to the discussion about how to set baselines for a sectoral NMBM by presenting and discussing possible sectoral baseline designs for three economic sectors: power, cement and buildings. We will first review the literature on the different design components of baselines. Then we will present a set of evaluation criteria for assessing the appropriateness of different baseline designs for the NMBM. And finally, we will assess different baseline designs for the three sectors, on the basis of available data on sector composition.[12] The selection of sectors allows the complexities of setting baselines in sectors with large-scale installations (power and cement) and in those with dispersed installations (buildings) to be considered. It will also allow assessment of different design possibilities for cases where sectors comprise heterogeneous technologies and installation types. Finally, lessons for new market-based mechanisms are drawn.

5.1 Overview of the literature on baseline setting

Substantive analysis on how to set baselines for emission reduction targets or for crediting systems has been available since the late 1990s when the discussions on how to implement the Kyoto Protocol and its flexibility mechanisms began. Drawing on the analysis made by Michaelowa (1998); Lazarus et al. (1999); Probase (2002); Broekhoff (2007); Schneider and Cames (2009); Hayashi et al. (2010); Prag and Clapp (2011); among others, we consider the following design elements of baseline setting:

- **Scope or level of aggregation**: Defines what categories of activities are covered by the emissions baseline. There are several dimensions in which the scope of a baseline can be defined:
    - **Process**: whether the baseline is differentiated by technology or process (e.g. a single baseline for the whole power sector, versus separate baselines for coal- or gas-fuelled power plants; or a baseline for direct emissions from fuel combustion in cement production, versus a baseline that also includes indirect emissions from electricity consumption).
    - **Product**: whether the baseline is differentiated according to the type or quality of product (e.g. primary/secondary aluminium as opposed to aluminium in general; or clinker versus cement).
    - **Time**: whether the baseline is based on the performance of installations of a specific vintage in a sector (e.g. average carbon intensity of all steel plants, versus average carbon intensity of all plants installed in the past 5 years).
    - **Space**: the geographic boundaries for which the baseline is applicable and from which data are drawn to establish the baseline (country, subnational region, group of countries, continent, whole world).
- **Reference data**: considers whether the baseline is set on the basis of the historical data within the scope defined above, or whether some kind of projection of future emission levels is performed. In the case of historical data, the baseline can further be based on a

[12] The objective of the case studies is to illustrate how sectoral baselines could be designed and what the challenges arising from such an exercise are. They should not be taken as proposals of real sectoral baselines in a specific country, but as examples of how baselines can be estimated and what considerations need to be taken into account. In order to make the case studies as close to reality as possible, they rely on real world datasets for specific countries. Where sufficient data is not available, plausible assumptions will be made and reported.

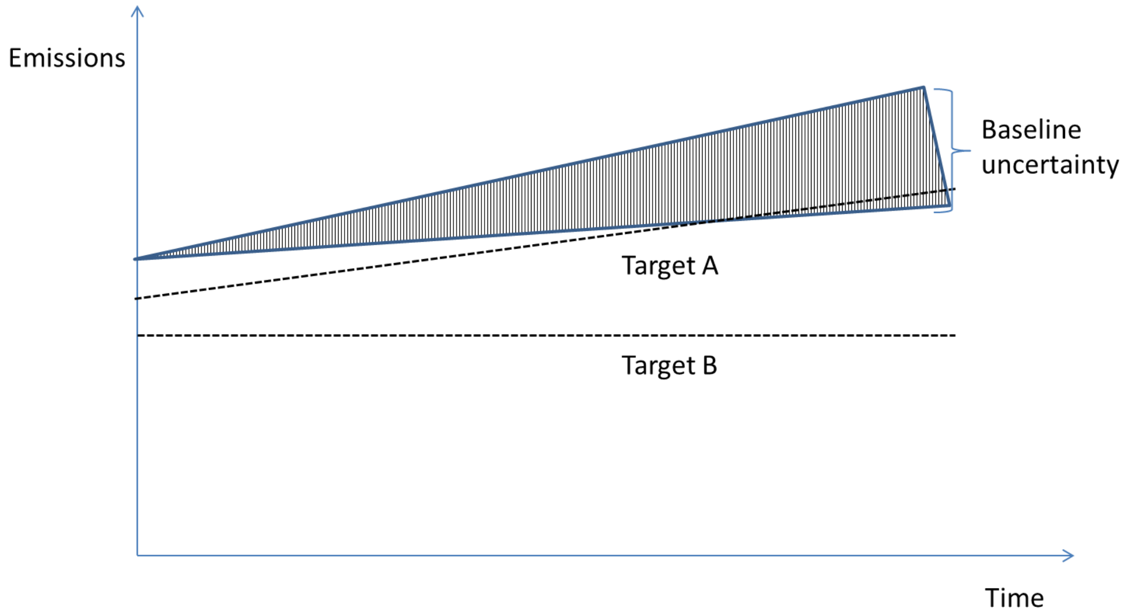
single time period (e.g. the 1990 base year for the Kyoto Protocol emission reduction commitments), or on the average emissions across several periods. If some kind of future projection is used, it can be a simple linear extrapolation of the emissions trend over several time periods, a projection based on expected changes in growth rates of the sector, or a more complex model that incorporates the effects of expected changes in other variables (economic and demographic variables, existing and expected policies, etc.). Data quality is also considered here.

- **Updating**: establishes whether the baseline is updated periodically once future information is available, how often this updating should take place, and which baseline parameters need to be updated.
- **Metrics**: whether the baseline should be set in absolute terms (total emission levels), in relative terms (emission levels indexed with respect to an indicator or a set of indicators such as economic size, or production output), or in terms of a technology penetration rate (share of a specific technology with respect to the whole output of a sector).
- **Stringency and conservativeness**: Operationalization of business as usual through an indicator can take many forms and it is often challenging to decide which indicator best represents business as usual. A conservative baseline setting approach, for example, uses a high percentile of the performance of all installations in a sector, instead of the sector average. Conservativeness helps to reduce the risks for environmental integrity arising from future uncertainty. But even if baselines are not conservative, targets / thresholds can be set in a stringent manner, i.e. significantly below the baseline. A stringent target or threshold contributes both to reducing the uncertainty problem and to the host country generating its own emission reduction contributions.

Figure 4 schematically shows that baseline uncertainty increases over time. Target A, which would be stringent if the “true” baseline lies at the upper end of the uncertainty range, becomes lenient if the “true” baseline is at the lower end of the baseline range. Target B remains stringent under all circumstances.[13]

[13] As explained above, in this study, we consider a baseline to be the projection of future emissions in a sector under a BAU scenario. This is different to some other conceptualizations in which the baseline itself is expected to be “stringent” or “ambitious”. The rationale behind our treatment is that we propose that a BAU baseline can (and should) be established on the basis of technical-economic data, while the stringency level will have a political component related to the choice of policy measures and ambition level by a specific government. By separating the technical from the political component, decision-making can be made more transparent. However, the operationalization of the baseline may still be done in a conservative way to reduce uncertainties about the actual business-as-usual path. A conservative baseline would be placed on the lower bound of the uncertainty interval, a lenient one on the higher end.

Figure 4: Baseline conservativeness compared to target/threshold stringency



Sectoral baselines are more comprehensive and potentially more complex than baselines for individual projects since they include all emissions of existing and future installations of the covered sectors. Determining such baselines is thus more similar to determining emission targets for Annex I countries under the Kyoto Protocol than to baseline setting under the CDM. Experience from project-based approaches can provide important insights but needs to be complemented by knowledge of emission projections for sectors and/or countries.

5.1.1 Baseline scope

As outlined above, the scope of a baseline defines what activities it covers. If we consider the NMBM as potentially becoming a sectoral crediting or sectoral trading mechanism, then the natural scope for this market mechanism is the "sector". However, there is no unique definition of what a sector is, as existing emission measurement systems (e.g. the IPCC classification for GHG inventories, or the EU ETS definition of covered sectors) frequently employ different definitions. Furthermore, while the widespread idea of a sector reflects the notion of an industry devoted to producing one type of product or service (e.g. cement, iron and steel, electricity, etc.), within these industries there are large differences in terms of production processes, product quality, age and size of installations that may make the installations not fully comparable (see e.g. Prag and Briner 2012).

Thus, for heterogeneous sectors there may be a need to establish separate baselines for different subgroups of products or installations and to determine an aggregate baseline that is, however, composed by multiple indexes that help to characterize the differences across subgroups (Schneider and Cames 2009). A similar approach would be required if implementing countries were intending to cover more than one sector or subgroup within their broad segment. A separate baseline would have to be established for each of the covered sectors or subgroups based on general and specific data and assumptions. Once the individual baselines are determined they can be combined to one aggregated baseline for the entire broad segment. This way it can be ensured that reliable and conservative baselines are determined while countries would still have the flexibility to optimize their reduction efforts among the sectors or subgroups covered under their broad segment once the NMBM is implemented.

As described by Hayashi et al. (2010), several dimensions can be used to define subgroups of installations that are covered by a baseline. The first two dimensions – **process** and **product** – consider disaggregation across technologies and product types or qualities. In general terms, the more disaggregated the baseline, the higher its accuracy in terms of representing the expected emissions level of a particular technology or product. However, the more disaggregated the baseline, the less it allows for broader mitigation options, and potentially also the more data-intensive it is. A fully disaggregated baseline would be akin to the project-type specific baselines used currently in the CDM.

Example:

A sectoral baseline for the transport sector could be defined as the level of emissions from transportation divided by the level of GDP in the country. Such a baseline would be relatively easy to estimate on the basis of data on overall consumption of transportation fuels and default emission factors. It would, however, be relatively imprecise in projecting future emissions because GDP is not the sole driver of transport emissions. But it would allow inclusion of the broadest possible range of mitigation measures, ranging from specific energy efficiency improvements, modal shift (e.g. from private to public transport, or from air to ground transport), to reductions in transport needs. A more disaggregated baseline, for example in terms of emissions per passenger-km or tonne-km in each transportation mode (road, railway, air, water), would more accurately reflect emission patterns in these subsectors, but would not incentivize emission reductions through modal changes and would be data-intensive (Schneider and Cames 2009).

Another critical aspect for a sectoral approach is whether to account for indirect emissions of electricity consumption in production processes. Considering these emissions allows for the inclusion of measures that reduce electricity consumption within the sector, but may lead to double counting if the broad segment covers the electricity sector as well.

The other two dimensions – **time** and **space** – may need to be taken into account for addressing further heterogeneity in a given sector. Determining the baseline for the entire sector will require a certain level of knowledge about the capacities, vintages and emission performances of the covered activities. In contrast to the CDM – where project-based baselines are mainly determined by the question what investors of new installations or retrofits would do in the absence of the CDM – baselines need to take into account all activities, i.e. existing ones of various vintages with or without a potential for retrofitting and projected new activities, under a sectoral approach. Recent capacity additions should, like the benchmark approach according to paragraph 48 (c) of the CDM's modalities and procedures, be used to reflect the emissions of new activities, but will require activity-specific data (Lazarus et al. 1999). However, the emission performance of new activities cannot be applied to project the business-as-usual emissions of an entire sector, particularly if the share of existing installations with high emission intensity is large. In most cases a more sophisticated approach would be required which takes into account closures of very inefficient activities as well as emission performances of retrofits in existing activities and of new installations based on a benchmark approach.

In terms of spatial differentiation, the “natural” scope level for a NMBM is a country’s sector, though other options may in some cases be more appropriate. On the one hand, subnational differences may arise in terms of feedstocks or fuel types for products such as cement, or in terms of heating and air conditioning needs for buildings in different geographic environments. This may be reflected by either different baselines or different input values for certain parameters of the baseline according to regional characteristics. On the other hand, in neighbouring countries with small markets and similar economies it may make more sense to establish baselines that are applicable to a group of countries in order to reduce data collection costs and avoid competitiveness and leakage issues. Here again, the more aggregated the baseline, the lower are the data and transaction costs.

Lazarus et al. (1999) discuss the essential trade-off between level of aggregation and types of mitigation measures incentivized. Aggregated baselines for entire sectors will be more efficient in terms of finding the least carbon intensive options throughout the whole sector. In heterogeneous sectors, this approach will provide the strongest mitigation incentives to subsectors that are, due to their specific characteristics, energy- or emissions-intensive. Lazarus et al. (2000) propose an hybrid approach to deal with this trade-off in the case of the electricity generation in the CDM: they propose a baseline composed of fuel-specific benchmarks that would be applicable for same-fuel efficiency improvement projects, and of a sector-wide benchmark that would be applicable to fuel switching projects or new installations. In the case of a sectoral NMBM, a similar effect could be achieved if sectors are disaggregated into existing and new installations.

As discussed by Murtishaw et al. (2006), spatial differentiation does not need to be set on the basis of administrative boundaries. For example, in the CDM different baselines are set for independent electricity grids within countries, which follows the delimiting lines of the transmission infrastructure. For land-use activities or buildings, spatial boundaries may follow biophysical characteristics, such as weather conditions or ecosystems. However, availability of aggregated data for determining sectoral baselines may often follow administrative boundaries.

5.1.2 Reference data

Ultimately, all baselines are based on historical data, which can either be used directly as the baseline – i.e. the past performance of existing facilities in the sector would be the reference for comparison – or can be used to project expected emission levels into the future. While projection-based baselines seek to more accurately reflect what activities would be displaced by the mitigation measures to be credited, they depend on many subjective and often intransparent assumptions, and are hence easier to manipulate (Michaelowa 1998; Lazarus et al. 1999).

In more detail, the following types of reference data can be used to set up a baseline:

- A single historical time period
- The average emissions level across several historical time periods
- A simple linear extrapolation of the emissions trend over several historical time periods
- A projection based on expected changes in growth rates of the sector

- A projection that incorporates the effects of expected changes in other variables (economic and demographic variables, existing and expected policies, etc.)
- In the absence of actual energy consumption or emissions data, nameplate parameters based on manufacturers' specifications or default factors applicable to certain geographical region(s) could be used (see Lazarus et al. 2000: 3-2).

Murtishaw et al. (2006) looked at the effect of different ways to use past reference data (without complex projections) on the baseline. They discussed that if emission levels remain stable historically, any past period could be used to establish an appropriate baseline. But if there is a downward or upward trend in past emissions, the more recent data periods should be used. If emission levels vary with no clear trend (they may depend on climatic or other external factors), an average over several years should be used to capture a representative level. Finally, if the historical emissions trend shows a clear break, it would be important to identify what caused that change in the trend and whether such change will be stable or not. If the break in the trend is due to, for example, a new policy or a technological breakthrough, the baseline should be established on the basis of the emissions data after the break point. In general, they recommend using longer time periods to minimize the effect of fluctuations.

On the basis of case studies of power sector installations in five developing countries, Lazarus et al. (1999) concluded that variations in the emissions intensity were unpredictable and unsystematic and could be affected by factors such as energy price shocks, new resource discoveries, technological advances and regulatory changes. They found that fuel choice was a better predictor of changes in emissions intensity than efficiency improvements. Thus they conclude that in the power sector, historical performance data are more reliable than projections as the latter are highly sensitive to the underlying assumptions. They found that projections made by different specialized bodies – or even by the same body but at different points in time – have high discrepancies with each other and can thus yield considerably different baselines. They therefore recommend that the baseline be based on historical data and be updated frequently to take account of the rapidly occurring changes in the sector's conditions, but that the frequency of updating needs to be balanced against certainty for investors. Larger groups of entities usually show lesser variance than individual installations. Therefore the conclusions of the analysis of individual installations cannot be directly transferred to the determination of sectoral baselines. Nevertheless, these conclusions illustrate the difficulties that need to be addressed when baselines are based on emission projections.

While the experience in using emission projections as the basis for setting emission reduction baselines is still limited (all Kyoto Protocol targets are based on historical emissions, EU ETS allocations are based on historical data or on benchmarks derived from existing installations), substantially more experience using models to predict future emission levels exists in Annex I national communications and in studies intending to estimate future abatement potentials. In their national communications to the UNFCCC, Annex I countries are supposed to report future emission projections for indicative purposes. Some of these projections include a business-as-usual scenario (BAU), a scenario that includes some mitigation measures, and a more ambitious scenario with more mitigation measures. These projections also rely on assumptions regarding economic growth, development of population and energy demand, etc. Similar projections also exist for some non-Annex I countries and have been prepared with a view to estimating future emission abatement potentials (see e.g. Cai et al. 2008 for the case of five economic sectors in

China). Here again, comparisons have revealed that different projections for the same country vary substantially (Prag and Clapp 2011). If models are to be used for baselines of the NMBM, either the assumptions behind the baseline calculations need to be revealed very transparently by the proposers, or a central authority under the UNFCCC needs to define a set of standard assumptions that apply equally to all baseline calculations. Examples of such standard assumptions could be: whether mitigation policies should be considered as part of BAU and if so, which policies and up to what year, how to project GDP and population growth, etc.

5.1.3 Dynamics and updating

Baseline emission levels may be fixed over time or be dynamic and incorporate some type of updating as conditions change (Lazarus et al. 1999).

Fixed baselines would, for example, refer to the 20% best emissions of all steel plants in the country over the years of 2005-2010. Investors in the sector would have full information about how to account for their emissions. Baselines could include an autonomous emissions improvement factor (e.g. baseline emission levels decline at a rate of 1% emissions each year) and assumptions on the development of demand. In this case, while the baseline emission levels change every year, the investor still has full information.

Dynamic baselines, in contrast, would be based on new empirical data (e.g. baseline emission levels are calculated as the rolling 3-year average emissions level of all steel plants in the country, calculated each year anew). In this case, the baseline would more clearly reflect the evolution of the sector, but its calculation would be more data-intensive and investors would not know future baseline emission levels in advance.

In addition to the dynamics that can be introduced in the baseline calculation itself, even fixed baselines may need to be updated periodically (every certain number of years, e.g. for new monitoring periods) to reflect changes in economic, social, technological and environmental circumstances, as happens for projects with several crediting periods under the CDM. Such updates may cover the whole baseline or just specific parameters within it (Hayashi et al. 2010).

The frequency of updating or the need to establish dynamic baselines depends on the speed with which the sector evolves in response to technological, policy or other environmental changes, on the cost of the revisions to the baseline and on considerations of certainty for investors (Lazarus et al. 1999).

Updating of baselines may undermine the investment certainty if investors of GHG mitigation strategies expect that the established baseline may be made more lenient at some point in time. To address such concerns and in order to provide sufficient investment certainty, as a general rule, baselines should be established for a long period of time on the one hand – ideally until the GHG emissions of the respective sector or subgroup become zero – and on the other hand updating should only be used for strengthening the baseline (e.g. every five years)[14]. This may result in a reluctance to initially agree to ambitious baselines but may also provide a gen-

[14] Investment uncertainty in this case is only reduced, though, if baseline updating is known ex-ante (i.e. during the time of the investment decision).

eral investment climate that makes a later strengthening of baselines more likely because low GHG technologies are spread more widely and quicker.

5.1.4 Metrics

There is substantive discussion on whether the baselines of a NMBM should be established on the basis of absolute emissions levels or of emissions levels with respect to output (i.e. emissions intensity, relative emissions or indexed emissions). Other proposals suggest using alternative metrics such as the share of a specific technology with respect to the output of a sector (penetration rates). This discussion is summarized in Prag et al. (2011).

An absolute baseline implicitly or explicitly makes assumptions about the expected level of activity in the sector. So, if the growth of the sector's activity is highly subject to external shocks or to factors that are difficult to predict, such as economic growth, relative or indexed baselines are preferred. This is likely the case in developing countries, whose economies are growing at a much faster pace than in Annex I countries. The absolute emission levels of relative or indexed baselines depend on the development of one single indicator or a set of indicators. The indicators, the data sources and the algorithm to calculate baseline emissions, all are determined ex ante while the absolute values of the baseline emissions are determined ex post.

However, relative or indexed emission thresholds are subject to the risk that they do not lead to a reduction of total emissions. This would be the case if the growth in output levels outweighs the reduction in relative emissions (Prag et al. 2011) which is frequently seen in rapidly growing developing countries with voluntary emission intensity pledges, e.g. China. To avoid restrictions to their economic development, developing countries may be reluctant to agree to ambitious absolute emission thresholds. If the underlying assumptions on economic development do not ultimately materialize, absolute emission thresholds may, on the other hand, result in substantial amounts of hot air, i.e. emission reductions are not result of mitigation efforts but of other factors (Schneider and Cames 2009).

Another metric that is being supported by stakeholders from developing countries is using technology-based standards to determine baseline emissions intensity. Such baselines would not directly be defined as emission levels, but derived from a predefined level of penetration of a desirable technology (e.g. X MW or Y % of renewable energy generating capacity). If defined as targets/thresholds, they would be substantially above the BAU course of action. This type of baseline and derived targets/threshold would reduce MRV costs, but the estimation of resulting emission reductions would need to be based on assumptions or estimations (again based on historical or similar data) for how the specific technology performs in terms of emissions (Lazarus et al. 1999; Prag et al. 2011). The uncertainty of such approaches is high.

5.1.5 Stringency level and conservativeness

As discussed above, there are two elements of stringency: choice of a conservative baseline among all possible baselines within the uncertainty range, and choice of a stringent target/threshold level with respect to the chosen baseline. This is expected to be a core area of political discussions in the UNFCCC, which needs to be informed by a thorough technical analysis. One example would be to set the baseline at the average or median emissions levels of the installations included within the sector boundaries defined above, which would reflect a representative performance of the sector, and would reward any activity that is even slightly better than the average. It would hence not incentivize substantial improvements over BAU. Better-than-average target or threshold levels (based e.g. on a pre-defined percentile of the best performing installations, or on the emissions level of a desirable technology) could be used to reward only activities that imply a significant improvement beyond the average level. However, the more ambitious the target or threshold, the fewer the installations that will effectively be incentivized to undertake a mitigation measure. Thus, the stringency level needs to be set at a level that "ensures a reasonable degree of environmental integrity while providing [...] sufficient incentives for investment" (Hayashi et al. 2010). As Broekhoff (2007) puts it, calibrating the stringency level is a matter of balancing "false positives" (too many non-additional measures are classified as additional because the threshold was set too lenient) and "false negatives" (too many measures that are actually additional are deemed to be non-additional, because the threshold was set too stringent). There is no technically correct way to calibrate the stringency level. Therefore, the calibration needs to be done according to the policy goals of the policy-makers.

In the end, however, it is likely that stringency levels will be a negotiated outcome between the host country representatives and a central authority or expert panel that assesses each proposed sectoral baseline. If host countries are left free to choose across design options regarding scope, reference data, dynamics and metrics, then a "standard" stringency level (such as the 20% best performance percentile established for the CDM under the Marrakesh Accords) cannot exist, and a desirable level needs to be established on a case by case basis.

5.2 Criteria for assessing baselines for the NMBM

In this study, we consider the following criteria for assessing the appropriateness of design options for baselines of new market-based mechanisms:

- **Environmental integrity**: it needs to be made clear that the conceptualization of environmental integrity is different under a sectoral market mechanism than under a project-based mechanism like the CDM. Under the CDM, demonstrating the additionality of a single mitigation measure in a single installation was the key for assessing whether "real" emission reductions are taking place. Under a sectoral NMBM, the additionality of individual measures is no longer as important, and does not need to be proven. But on aggregate, additionality is still important, as business-as-usual should by definition mean the sectoral production path with the highest profit level. As the emission reductions are to be credited for a whole sector, it is also no longer important to establish a clear causality link between an individual mitigation measure and the emission reductions achieved. As credits or allowances are issued only with respect to achievement of the overall emissions threshold or target, it is eventually a matter for the national government to decide how it rewards good performers and penalizes bad ones. From an international point of view it is crucial that the overall threshold constitutes a deviation from BAU (additionality at the sectoral level), and that the BAU emissions level for the sector is credibly defined. We will consider the following indicators of environmental integrity:
    - **Scale of real and additional emission reductions**: whether the threshold leads to emission reductions below BAU;

- **Consideration of policies in baseline setting**: whether the baseline incorporates the effect of existing climate-friendly policies under the BAU scenario;
- **Possibility of allocating reductions to own effort, supported activities and credited activities**: whether the baseline type allows for differentiating reductions that are due to own effort (e.g. existing or new policies), to international financial support (NAMAs) and to the NMBM.

- **Transparency**: whether all assumptions leading to the baseline can be clearly communicated and understood.
- **Flexibility**: whether the baseline-setting methodology provides the host country with flexibility in terms of design options that are most suitable for its own circumstances.
- **Data requirements**: whether the baseline setting methodology has data requirements that can be easily met by developing countries in a sectoral manner.

5.3 Assessing baselines for the NMBM: power sector

5.3.1 General characteristics of the sector

The power sector is one of the most important sectors globally. Global electricity generation was 11.8 PWh in 1990 and 21.4 PWh in 2010. Under current policies, global electricity generation may rise to 36.5 PWh in 2030. CO_2 emissions in the power sector were 7.5 Gt in 1990 and 12.5 Gt in 2010. CO_2 emissions are expected to rise to 14.7 Gt in 2030. The power sector is therefore of utmost importance for the mitigation of climate change. The main fuel consumption for power generation in 2010 stems from coal (46%), followed by natural gas (23%) and nuclear (15%). Renewables accounted for 10% of overall fuel consumption for electricity generation in 2010 (IEA 2012).

The highest contribution to the overall climate impact of electricity generation comes from CO_2 which is directly linked to the type and amount of fuel consumed by the power plants. Minor contributions stem from CH_4 and N_2O and are dependent on the type of fuel used as well as the combustion conditions of the respective technology.

The size of power plants ranges from small decentralised installations such as diesel generators or photovoltaics to large central power plants such as based on nuclear, coal, natural gas or hydro. Power plants can be classified according to a range of features. They may be based on renewable, fossil or other fuels (such as nuclear). Power plants may produce electricity only (e.g. condensing-type power plants or wind generators) or may co-produce heat for space heating or industrial process heat (so-called combined heat and power (CHP) plants). There is also a wide variety of technology types applied such as steam turbines, gas turbines, combined cycle power plants, different renewable technologies or a combination of different technologies. Power plants may be operated by central operators or independent power producers (IPP) and may serve both the overall supply of the area (e.g. power plants operated by electric utilities) or more specifically the electricity demand in a specific sector, e.g. in the industry (captive power plants). The heterogeneity of technologies as well as the number of installations and of operators depends on the specific circumstances in each country.

CO_2 emissions from electricity generation depend on the type of fuel used. In this regard, lignite has the highest specific CO_2 emissions (101 t CO_2/TJ), followed by hard coal (94.6 t CO_2/TJ[15]) and natural gas (56.1 t CO_2/TJ) (IPCC 2006). Renewable energy sources do not generate direct CO_2 emissions. The amount of CO_2 produced furthermore depends on the electric efficiency of the power plant, which may range from 30% (or less) for old inefficient power plants to 60% for new combined cycle natural gas-fired power plants. The resulting specific CO_2 emissions range from 0 g CO_2/kWh for renewables over 350 g CO_2/kWh for a state-of-the-art natural gas-fired combined cycle power plant to 1,200 g CO_2/kWh (or more) for an old lignite-fired power plant. Overall CO_2 emissions of the power sector finally depend on the overall electricity demand.

Against this background, several options are available to reduce greenhouse gas emissions from electricity generation. One option is the increase of the electric efficiency of power plants. On the one hand, new power plants have higher electric efficiencies than older plants. On the other hand, the electric efficiency may be increased retrospectively (e.g. by retrofitting or repowering) or by choosing a different plant configuration (e.g. combined cycle instead of single cycle). Another option relates to fuel switch, for instance from lignite to hard coal or from hard coal to natural gas. A further possibility is to build and operate power plants in cogeneration mode rather than in electricity-only mode[16]. Furthermore, the increased use of renewable electricity generation reduces greenhouse gas emissions in the power sector. Another option is the capture of CO_2 from the flue gas of the power plant and the disposal in storage sites underground, so-called carbon capture and storage (CCS). However, this option is still under research. There may also be different combinations of the options mentioned above, such as the shift from an old coal-fired power plant to a new high-efficiency combined cycle natural gas-fired power plant. Finally, the electricity demand directly affects greenhouse emissions in the power sector.

A potential baseline for the power sector therefore needs to deal explicitly with the following specific design elements with respect to its level of aggregation:

- **Process:** Depending on the data availability, different electricity generation technologies may be differentiated.
- **Product:** No differentiation needed due to a single homogeneous product (electricity)[17].

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[15] Category "other bituminous coal" (IPCC 2006).

[16] It has to be noted, though, that the electric efficiency of CHP plants is usually lower than of the same power plant in condensing mode. However, since CHP plants also produce heat for space heating or industrial use, fuel consumption may be reduced in other sectors (e.g. by displacing the use of natural gas or light fuel oil to produce heat in boilers). However, this reduction effect would only be visible in the final consumption sectors.

[17] Cogeneration of electricity and heat constitutes a special case since it cannot be directly compared to electricity-only power plants. Extensive literature is available on this matter. However, this specific case is not further investigated as part of this case study. Furthermore, electricity generation may be differentiated with regard to load characteristics (base load, intermediate load, peak load). Different power plant types are dispatched to cover these load ranges. In this regard, specific CO_2 emissions also depend on the load range. However, since the whole

- **Time:** The baseline may consider the development of the power plant in the past (fuel types, electric efficiencies, etc.) as well as the autonomous improvement of efficiency in the future.
- **Space:** Generally all power plants in the sector under consideration should be included in the derivation of the baseline. The sector in this regard may, for instance, cover all power plants of a country or region. However, different regions (and even countries) may be connected by the same grid. Therefore, the delineation of the sectoral boundary may be set at all power plants serving a power grid or a set of connected grids operating in synchronous mode. The definition of the sectoral boundary also addresses specific geographical conditions, such as the availability of renewable or fossil resources in the area or grid, which should be considered for baseline setting[18].

In the following section, we present examples of how baselines for the power sector could be developed on the basis of publicly available bottom-up data for an advanced developing country.

5.3.2 Case study of sectoral baselines in the power sector

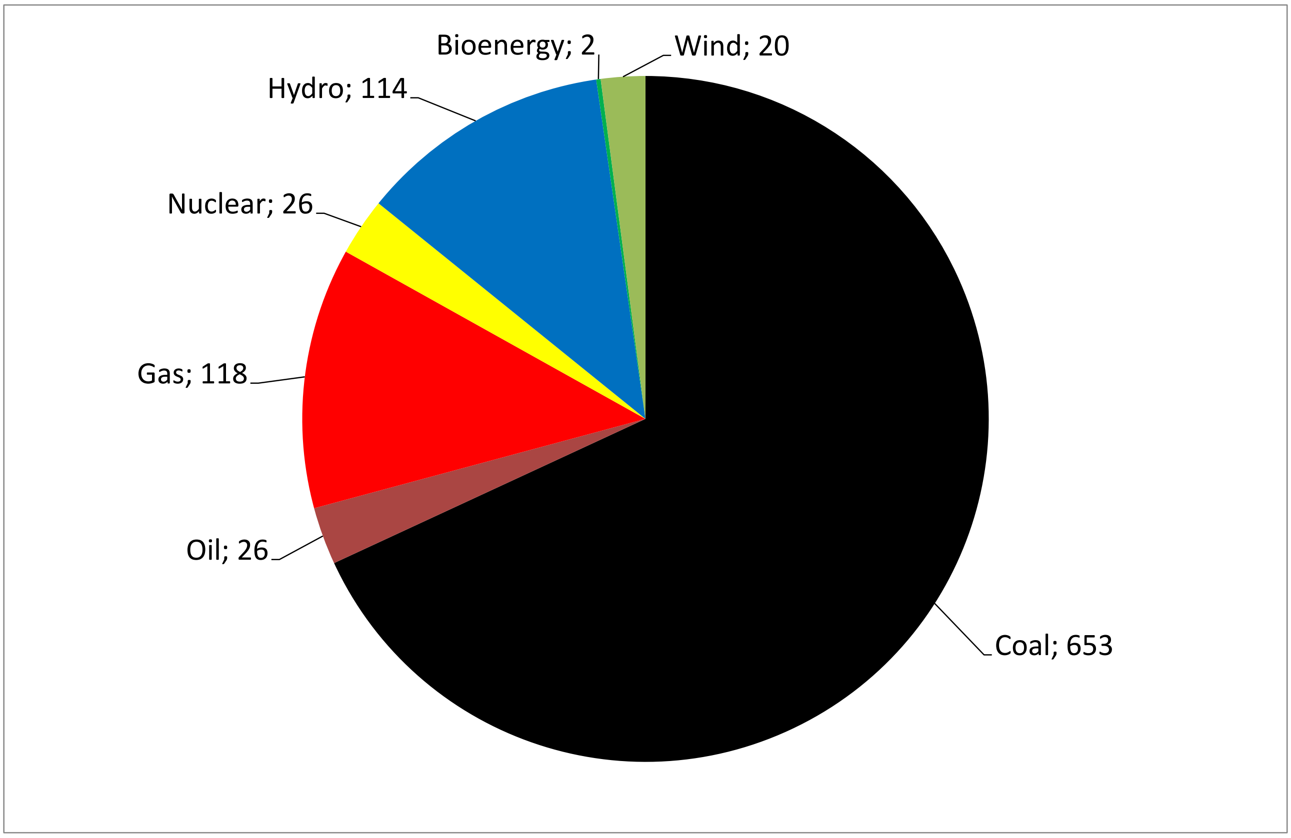
For the purpose of the case study, the choice of the country was guided by two principles. Firstly, the power sector should be sufficiently large in order to represent an important source of greenhouse gas emissions and thus of climate mitigation. Secondly, the public availability of detailed power plant data is crucial for baseline setting. Against this background, India was chosen as the example for the case study. However, the exercise may be carried out for other countries, too.

Electricity generation in India amounted to 960 TWh in 2010. The main part stems from coal (68%), followed by natural gas and hydro (each 12%). Minor shares come from oil, nuclear and wind (Figure 5). Overall installed electrical capacity amounted to 189 GW in 2010 with 53% coming from coal, 21% from hydro and 11% from natural gas-fired power plants. Overall CO_2 emissions from power generation amounted to 872 Mt in 2010 (IEA 2012).

power plant sector is considered, all kinds of load situations (off-peak, peak, etc.) are covered. For this reason, there is no differentiation according to load ranges for the derivation of sectoral baselines.

18 For instance, in a grid without hydro resources, hydro power plants can be ruled out as potential power plant option for baseline setting.

Figure 5: Electricity generation in India (TWh), 2010



Source: IEA 2012

For the assessment of potential sectoral baselines in the power sector, two sources of data were assessed for suitability, the IEA GHG CO_2 Emissions Database and a database from the Central Electricity Authority of the Government of India.

The IEA GHG CO_2 Emissions Database (IEA 2008) contains emissions data from over 8,000 large point sources such as from the power sector, iron & steel, the chemical industry and several other industry branches. The quality of CO_2 emission estimates varies, ranging from "very high, confirmed by contact person" to "low (based on calculation with emission factors and capacity)".

In the case of India, all data are estimated based on the unit capacity of the power plant, assumed operating hours and a specific CO_2 emission factor depending on the type of fuel. There is no further differentiation of operating hours or CO_2 emission factors. Vintages of power plants (construction years) are not available. Emissions data are available for some years; however, there is no systematic time series of emissions.

Based on this dataset, it is not possible to derive an absolute CO_2 emission baseline since a systematic time series is not available. Also, since there is no information on vintages, efficiencies (and corresponding specific CO_2 emission factors) and operating hours for different years, it is not possible to derive an indexed baseline based on trends related to specific CO_2 emissions, fuel mix, etc.

The database by the Central Electricity Authority of the Government of India (Central Electricity Authority 2012a) provides data on Indian power plants including installed capacity, fuel as well as electricity generation, CO_2 emissions and resulting specific CO_2 emissions for five years (2006 to 2010[19]). The database covers installations with an installed capacity of at least 3 MW for hydro and 10 MW for other power plants. Both utilities and independent power producers (IPP) are covered. However, captive power plants[20] and non-conventional renewables such as wind, biomass, solar photovoltaic and hydro below 3 MW of installed capacity are not included. Data are available for the Northern, Eastern, Western and North-Eastern grids (NEWNE) as well as for the Southern Grid. The two grids are expected to be synchronously operated in the next few years. Also, the Southern Grid already has some connections to the Western and Eastern Grid. As part of this analysis, it is therefore assumed that by the time a new market-based mechanism is introduced, the whole of India is integrated in one grid. For this reason, all power plants included in the database (NEWNE grids and Southern Grid) are considered in the following analysis. The power plants usually include several units with a specific commissioning date each. In the analysis, each unit is considered separately, allowing for a more detailed differentiation according to vintages (construction years). It has to be noted, though, that for the individual units, only the construction year and the installed capacity are available in most cases whereas the yearly electricity generation and the corresponding CO_2 emissions are only available for all units of the same power plant together. For the analysis, electricity generation and CO_2 emissions are therefore distributed to individual units by considering the installed capacities of the unit. The dataset does not allow differentiation of operating hours or specific CO_2 emissions between the different units[21]. Some power plants run on two fuels (main fuel and auxiliary fuel, such as for start-up of the power plant). In the following, only the main fuel is considered for the classification. Furthermore, the dataset is corrected for abnormal operating conditions. On the one hand, the first year of operation of each newly-commissioned power plant is not considered in the analysis since fuel consumption and specific CO_2 emissions may be abnormally high due to initial testing of the power plant. On the other hand, the specific CO_2 emissions of a power plant in individual years are neglected that are at least 5% above the lowest value of all years. The underlying rationale is that the lowest specific CO_2 emissions are generally achievable by the power plant from a technical point of view and that significantly higher specific CO_2 emissions are therefore not plausible. An increase of 5% over the lowest value considers normal technical variations such as operation in part load or deterioration of plant efficiency over time due to tear and wear. Table 2 gives an overview of the net electricity generation

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[19] The respective fiscal years are considered.

[20] Captive power plants play an important role in India due to the instability of the grid, and produced 90 TWh in 2008, i.e. around 10% of the total electricity (Nag 2010, p. 199).

[21] This constitutes a significant data limitation. Power plants may comprise several units with different technologies and construction years. Therefore, in reality, operating hours and electric efficiencies (and ensuing specific CO_2 emissions) may differ significantly between the individual units of a power plant.

and CO_2 emissions of the Indian power plants included in the database (after correction for abnormal values) for the years 2006 to 2010[22].

Table 2: Net electricity generation and CO_2 emissions of Indian power plants, 2006-2010

	Net generation (TWh)					CO_2 emissions (Mt)				
	2006	2007	2008	2009	2010	2006	2007	2008	2009	2010
Total	497	503	482	578	625	370	380	357	439	463
Nuclear	14	14	13	16	20	0	0	0	0	0
Lignite	18	20	18	21	20	25	29	25	30	29
Coal	310	322	304	367	386	324	336	314	378	398
Gas	43	27	33	62	67	20	13	15	28	29
Diesel	0	0	0	0	1	0	0	0	0	1
Oil	1	1	0	5	2	1	1	0	3	1
Naphtha	1	0	6	1	12	0	0	3	0	5
Hydro	110	117	108	106	115	0	0	0	0	0

Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

In the following, two different baselines are proposed: an absolute baseline based on the overall CO_2 emissions of the power sector (section 0) and an indexed baseline based on specific CO_2 emissions of the power sector and the fuel mix (section 0).

Absolute baseline

A baseline related to the development of overall CO_2 emissions of the sector over time can be derived in several ways. The future development may be projected as a trend extrapolation of historical CO_2 emissions with the possibility of using different reference periods (e.g. 2000-2010, 2005-2010, etc.). The development of overall emissions may also come from more sophisticated macro-economic modelling, taking into account the development of fuel prices, economic growth, the interactions between sectors, etc.

If it is assumed that the absolute CO_2 emissions of the Indian power sector follow between 2010 and 2030 the same trend as between 2006 and 2010, the absolute CO_2 emissions would more than double and grow from 463 Mt in 2010 to 940 Mt in 2030[23] (Figure 6).

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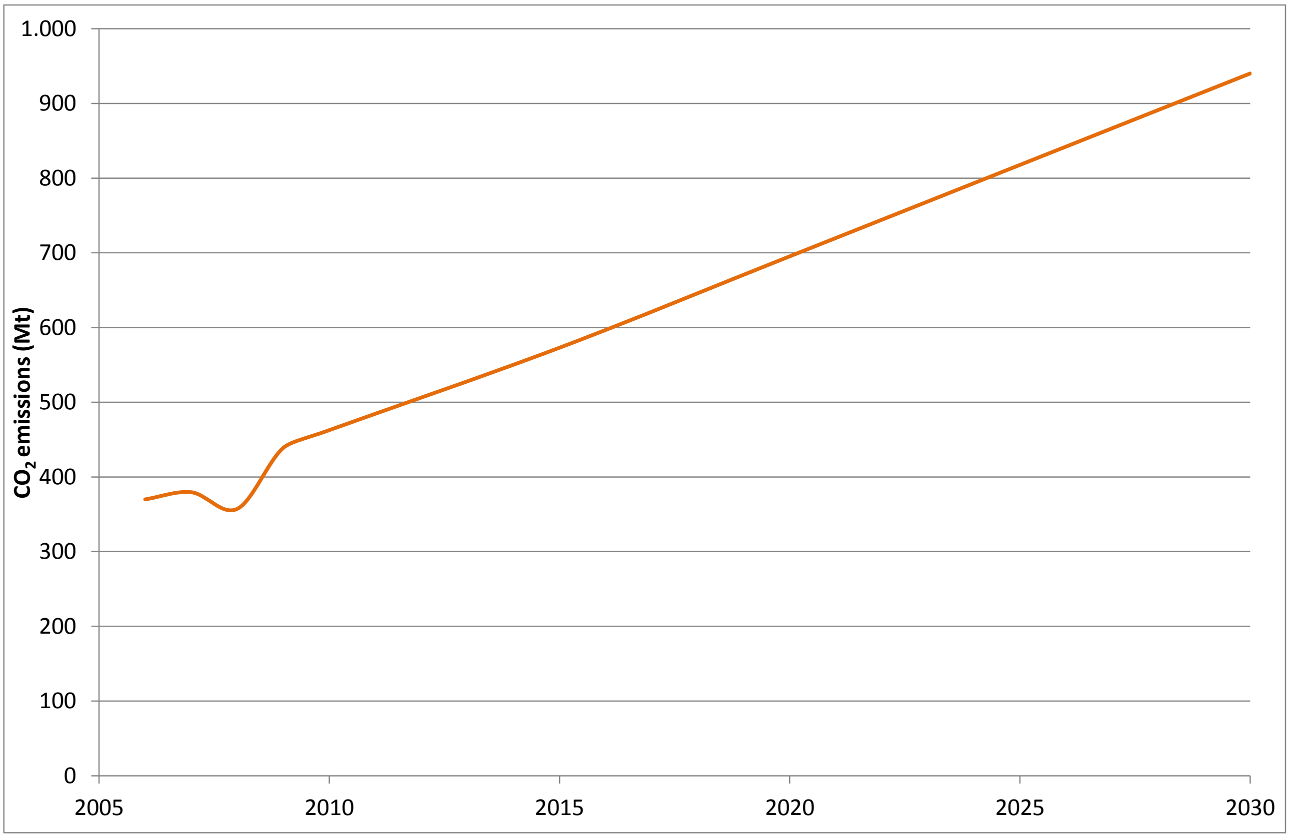
[22] Due to the restrictions related to coverage mentioned above, the overall electricity generation is less than reported by IEA (2012). Furthermore, variations between the years may be due to correction for outliers.

[23] It has to be noted that the coverage of power plants in the dataset may not be homogeneous over the years due to the correction for abnormal values (see above). Therefore, the estimated trend involves some uncertainty.

Figure 6: Overall CO_2 emissions in the absolute baseline



Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

However, since the basis for such a trend projection which can be derived from the databases used for this analysis is quite short, this trend cannot be considered as a reasonable trend projection of the Indian power sector.

Indexed baseline based on specific CO_2 emissions of the power sector and the fuel mix

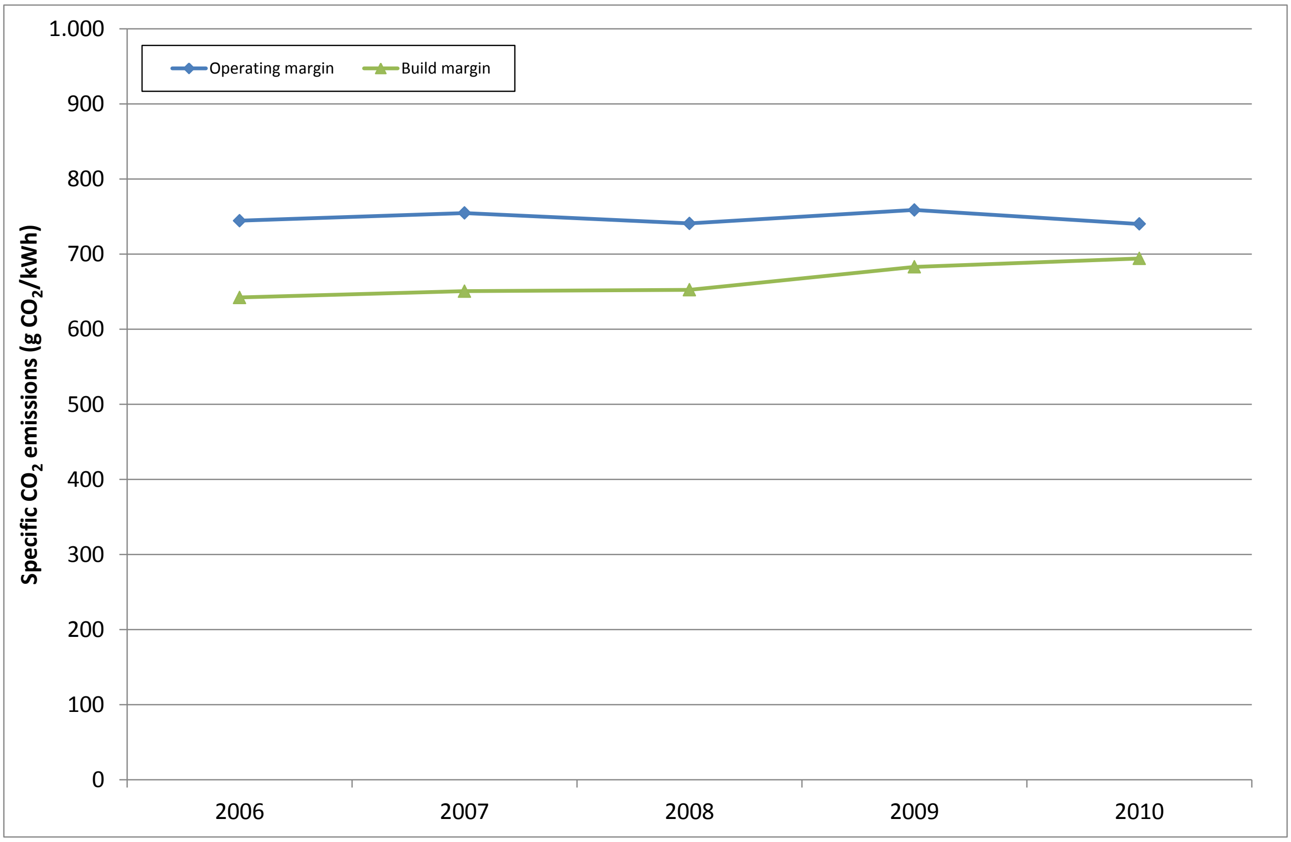
In order to derive an indexed baseline based on specific CO_2 emissions of the power sector and the fuel mix, an analysis has to be conducted related to the existing power plant fleet. In the following, the Indian power plant fleet is analysed with regard to specific CO_2 emissions of the power sector as a whole, with regard to specific CO_2 emissions of individual power plant types and with respect to the development of the fuel mix in the sector. Based on these analyses, a consolidated indexed baseline based on specific CO_2 emissions of the power sector and the fuel mix is derived.

Development of specific CO_2 emissions of the power sector as a whole

Specific CO_2 emissions of the power sector as a whole can be calculated in several ways. On the one hand, the analysis may be based on historical specific CO_2 emissions. This may consider different reference periods for the calculation (see section 0). On the other hand, it may consider only recently built power plants as a proxy of the most probable investments in the future.[24]

For the purpose of this case study, two types of specific CO_2 emission of the power sector as a whole are derived. For the operating margin, specific CO_2 emissions of all power plants from 2006 to 2010 are considered, including thermal, nuclear and hydro. For the build margin, specific CO_2 emissions of new power plants are calculated for the years 2006 to 2010 based on the power plants built in each respective year and four years prior to the year under consideration. For instance, the build margin of the year 2010 corresponds to the specific CO_2 emissions of all power plants commissioned in the years 2006 to 2010 (Figure 7).

Figure 7: Specific CO_2 emissions of the power sector according to the operating margin and the build margin, 2006-2010



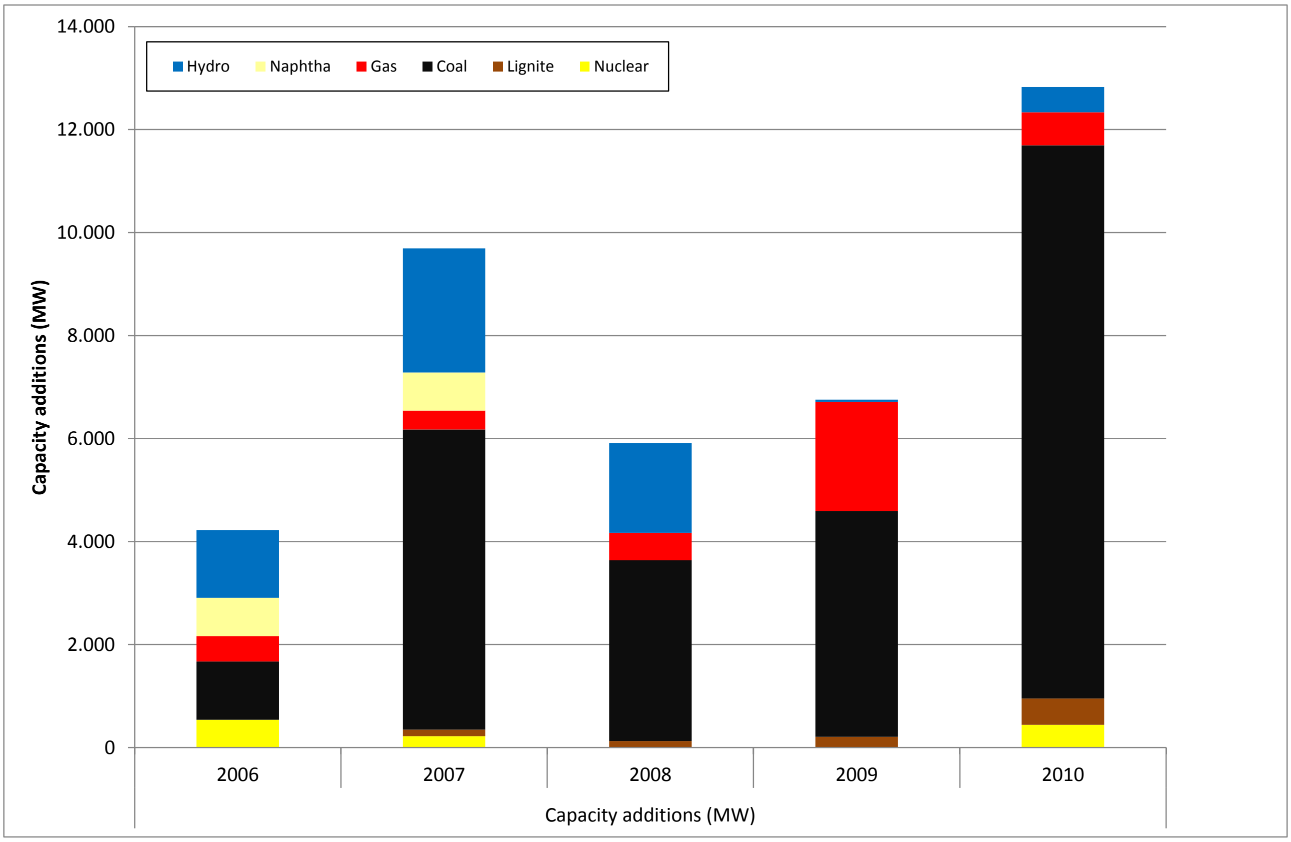
Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

Specific CO_2 emissions based on historical levels (operating margin) remain rather constant at approximately 750 g CO_2/kWh. This is due to the fact that the net electricity generation and CO_2 emissions grow in parallel between 2006 and 2010 and the fuel mix also remains rather constant (Table 2). The build margin, in contrast, features lower values for all years (642 to 694 g CO_2/kWh). This can be explained by the fact that new power plants are generally more efficient than incumbent ones. Also, capacity additions of hydro and natural gas-fired power plants

24 Under the CDM, several approaches on how to derive a specific CO_2 emission factor for the power sector are discussed.

partly compensate for the higher specific CO_2 emissions of hard coal-fired power plants (Figure 8).

Figure 8: Capacity additions in the Indian power sector, 2006-2010



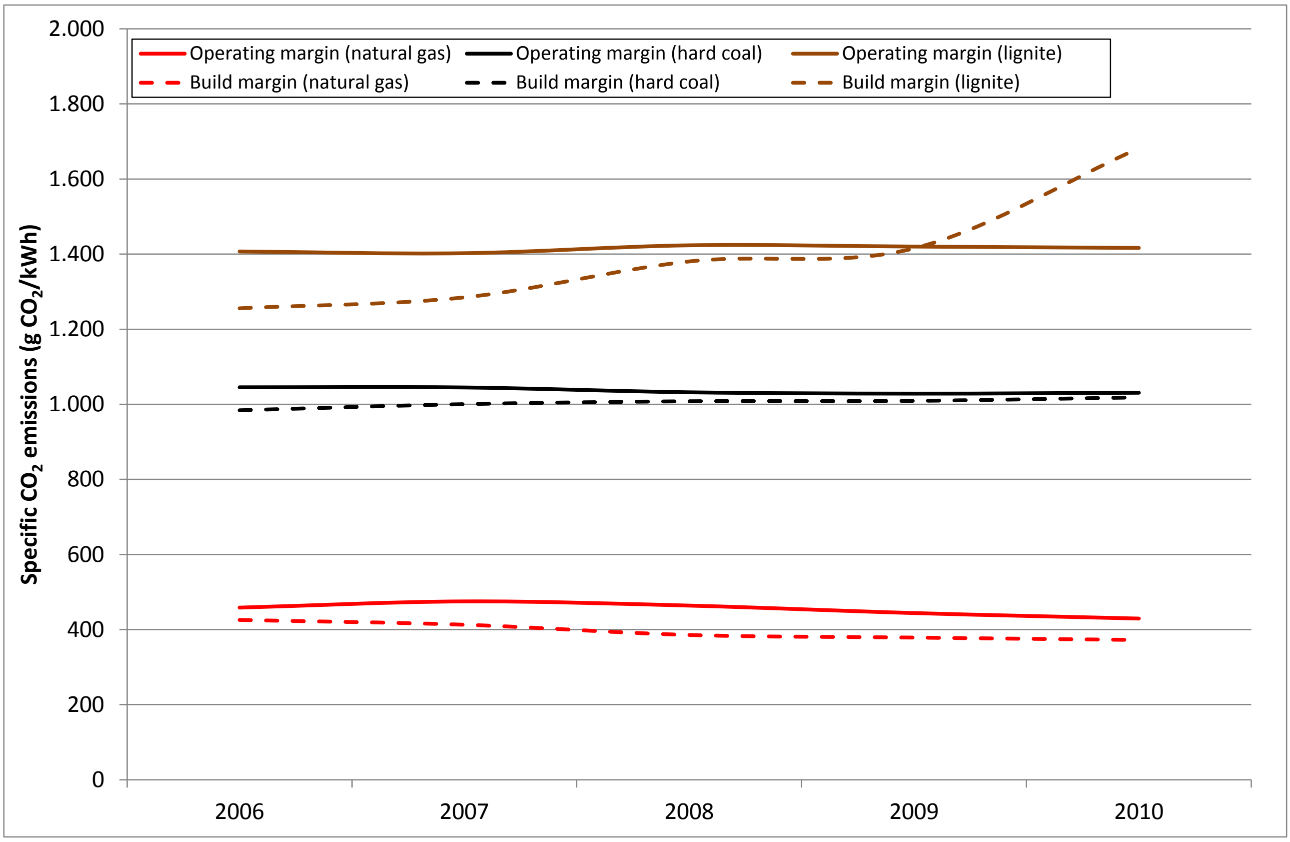
Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

The build margin is based on the years 2006 to 2010. However, the calculation may require updating since investment conditions, exploitation potential (e.g. hydro) and technical specifications (such as the electrical efficiency) may change over time and therefore cannot simply be assumed as ongoing in the future.

Development of specific CO_2 emissions of individual power plant types

For the purpose of this case study, two types of specific CO_2 emissions of individual power plant types (differentiated by fuel) are derived. The methodology generally follows the same rationale as for the specific CO_2 emissions of the power sector as a whole. For the operating margin, specific CO_2 emissions in the years 2006 to 2010 are considered. The build margin of new power plants is calculated for the years 2006 to 2010 based on the power plants built in the respective year and four years prior to the year under consideration (Figure 9).

Figure 9: Specific CO_2 emissions of power plant types (natural gas, hard coal and lignite) according to the operating margin and the build margin, 2006-2010



Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

Generally, it can be expected for all power plant types that specific CO_2 emissions decrease over time as more efficient power plants are put online. This holds true both for the operating and the build margin. Also, the build margin is expected to have lower values than the operating margin due to more recent construction years and the correspondingly higher efficiencies of power plants. However, due to specific operating conditions (cycling, etc.), specific CO_2 emissions may also increase temporarily.

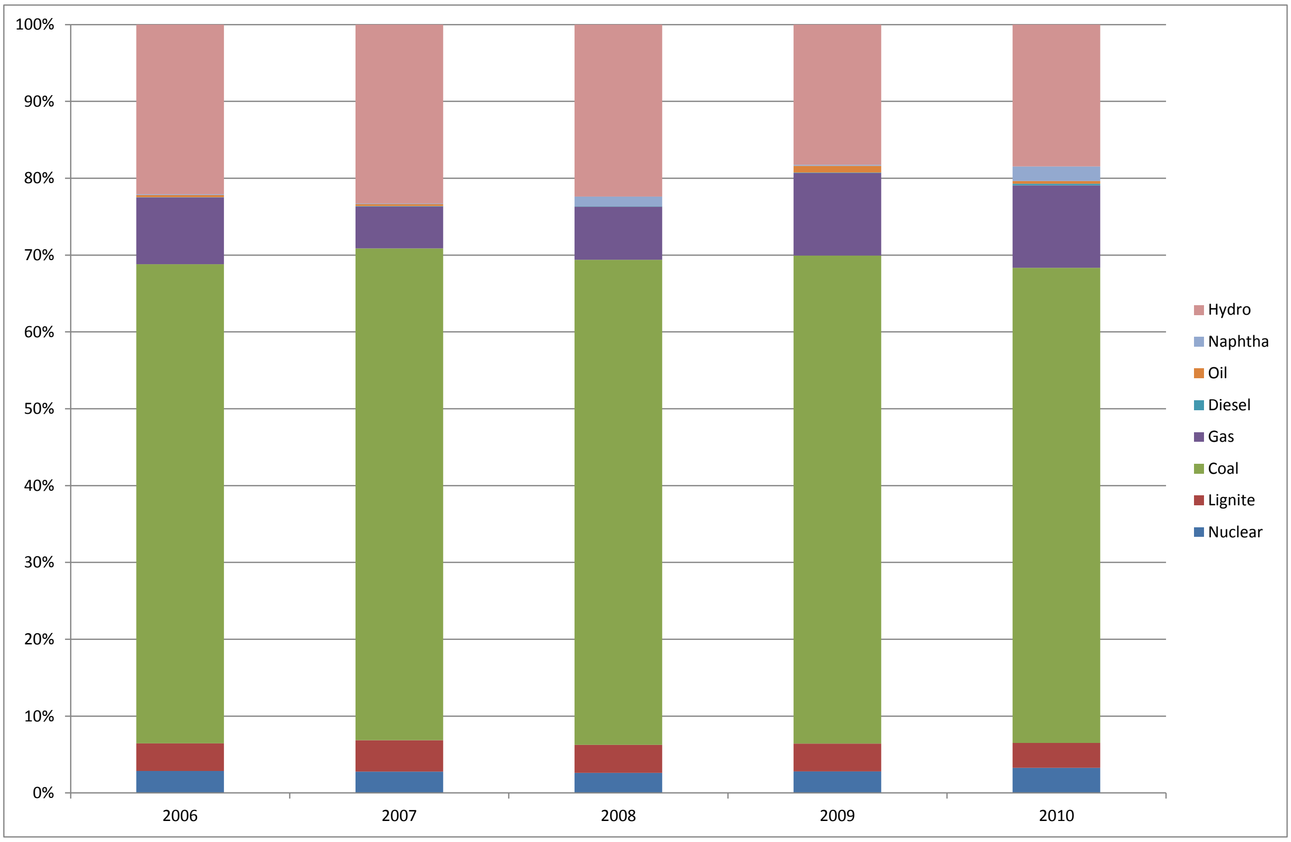
In Figure 9, the operating margin of lignite-fired power plants in the dataset is rather constant over time at around 1,410 g CO_2/kWh. The build margin of lignite-fired power plants shows a significant increase of specific CO_2 emissions between 2008 and 2010, which even goes beyond the specific CO_2 emissions of the operating margin in 2010. This is not plausible for the reasons mentioned above. Therefore, the lower build margin values of lignite for the years 2006 and 2007 are considered as the most realistic values (1,270 g CO_2/kWh).

Both the operating margin and the build margin of hard coal-fired and natural gas-fired power plants indicate a rather constant trend (approx. 1,040/1,000 g CO_2/kWh for hard coal-fired power plants and 450/400 g CO_2/kWh for natural gas-fired power plants). Values for the build margin lie below the ones for the operating margin, which is plausible for the above-mentioned reasons.

Development of the fuel mix

Similarly, to the trend in specific CO_2 emissions, the development of fuel mix in the power sector can be analysed (Figure 10). The development of the fuel mix between 2006 and 2010 shows a sensible increase of the share of gas-fired electricity generation (from 9% in 2006 to 11% in 2010) whereas the share of other fuels remains rather constant. Hydro features a decreasing trend (from 22% in 2006 to 18% in 2010), which may be due to variations in hydrological conditions.

Figure 10: Fuel mix (basis electricity generation), 2006-2010



Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

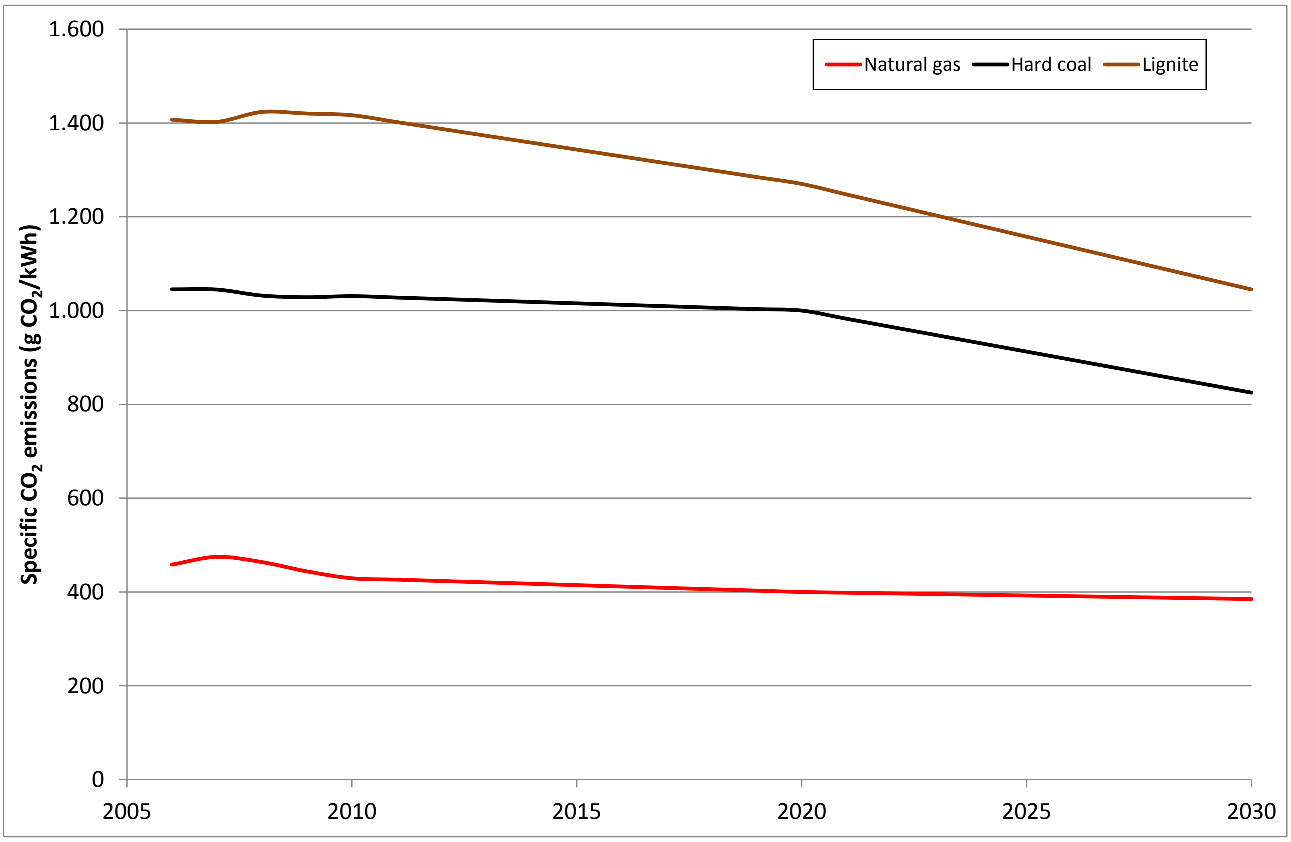
Consolidated indexed baseline based on specific CO_2 emissions of the power sector and the fuel mix

In reality, several aspects of the power sector may evolve simultaneously, specific CO_2 emissions of individual power plant types, fuel mix and overall electricity consumption. Different combinations thereof may be modelled. For the purpose of this case study, a combined indexed baseline based on specific CO_2 emissions of power plant types and the fuel mix is proposed. An absolute baseline is subsequently derived based on assumptions regarding the development of the electricity consumption.

Based on the analysis above, the following rationale for deriving the baseline is used:

Specific CO_2 emissions of individual power plant types (for all power plants of the same fuel) start at the operating margin of 2010: 1,416 g CO_2/kWh for lignite, 1,031 g CO_2/kWh for hard coal and 429 g CO_2/kWh for natural gas. It is assumed that the average efficiency of all power plants in the sector reaches the level of the build margin of the years 2006 to 2010 by 2020 (Figure 9). This is a conservative assumption since old power plants are gradually decommissioned and replaced by (more efficient) ones. In 2020, specific CO_2 emissions of all power plants therefore reach 1,270 g CO_2/kWh for lignite-fired power plants, 1,000 g CO_2/kWh for hard coal-fired power plants and 400 g CO2/kWh for natural gas-fired power plants. State-of-the-art power plants today feature specific CO_2 emissions of 950 g CO_2/kWh for lignite-fired power plants, 750 g CO_2/kWh for hard coal-fired power plants and 350 g CO_2/kWh for combined cycle natural gas-fired power plants. For 2030, it assumed that the share of state-of-the-art power plants has increased significantly, in a way that average specific CO_2 emissions in 2030 are only 10% above today's state-of-art power plants (1,045 g CO_2/kWh for lignite-fired power plants, 825 g CO_2/kWh for hard coal-fired power plants and 385 g CO_2/kWh for natural gas-fired power plants). This development can be considered as autonomous improvement of the power sector (Figure 11).

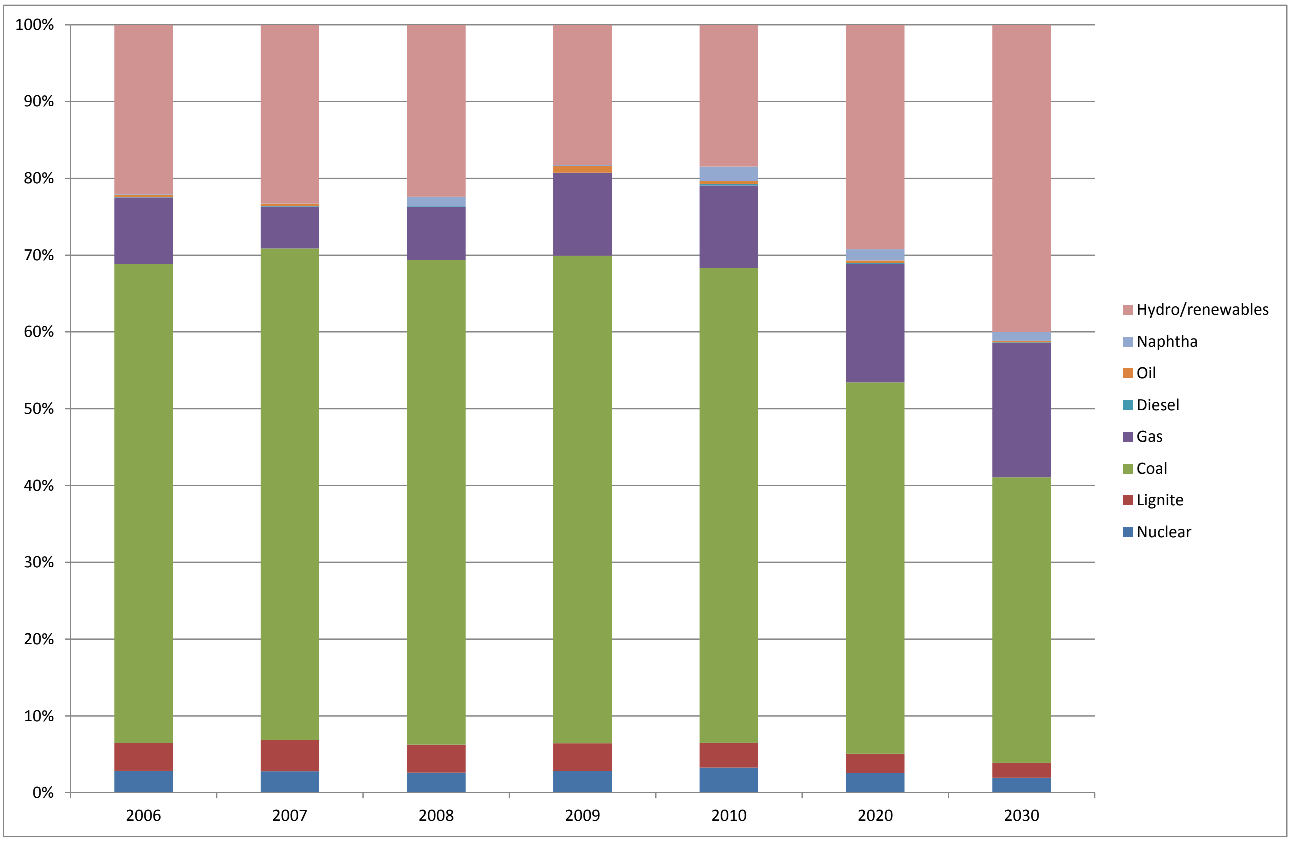
Figure 11: Historical and assumed projected specific CO_2 emissions of individual power plant types, 2006-2030



Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

Fuel mix: The starting point of the development of the fuel mix is the fuel mix in 2010. It is assumed that the contribution of natural gas to the overall electricity mix continues to grow in the same manner as in 2006-2010 (Figure 10). Furthermore, it can be expected that due to significant cost decreases, renewable electricity generation, especially based on wind and PV, will grow substantially. An overall share of renewables of 40% in 2030 is assumed (starting from 18% hydro in 2010). The contribution of other fuels to the fossil electricity generation remains the same. Overall due to the increase in renewable electricity, natural gas is the only fossil fuel that shows a resulting increase of the generation share whereas all other fossil fuels have decreasing shares (Figure 12).

Figure 12: Historical and assumed projected fuel mix, 2006-2030

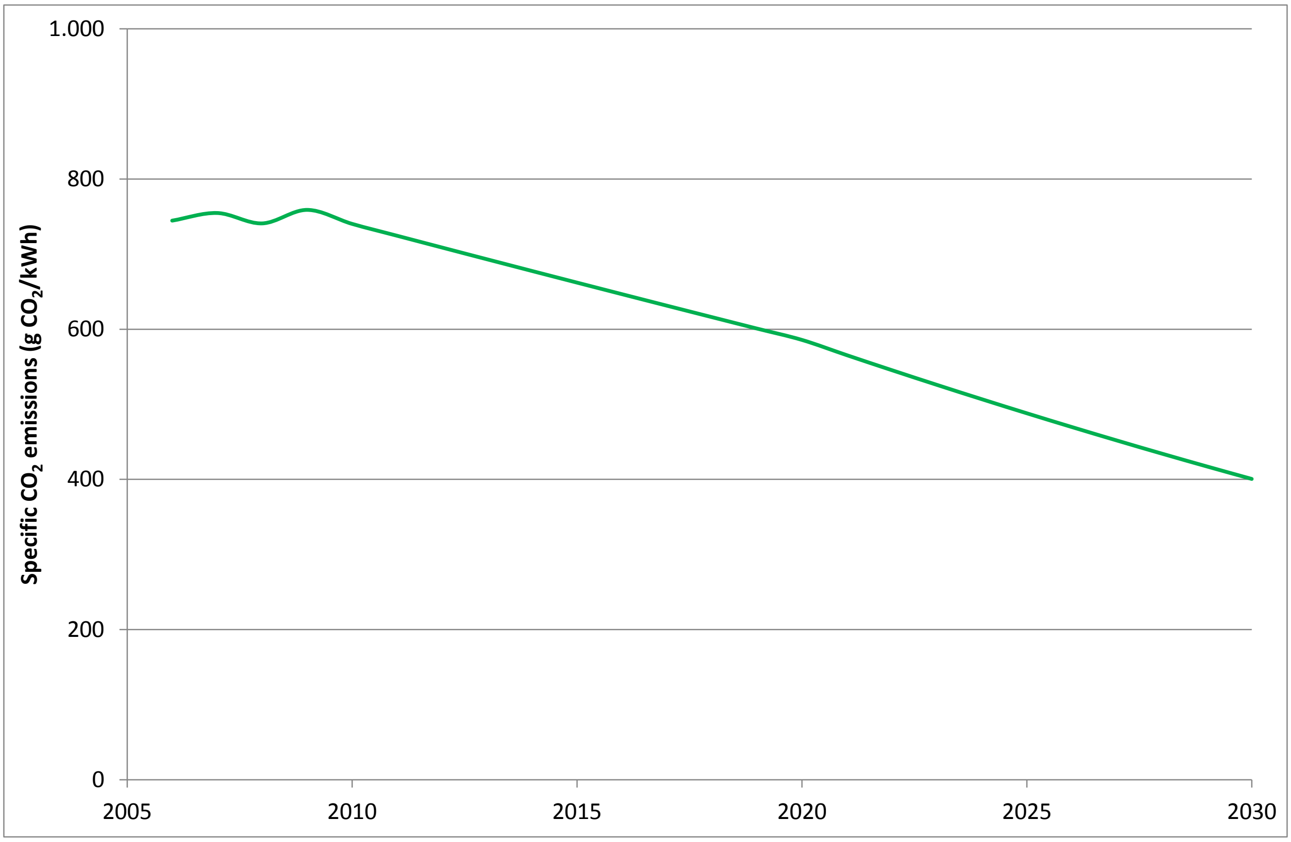


Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

Figure 13 shows the development of the specific CO_2 emissions of the power sector resulting from the above-mentioned development of the specific CO_2 emissions of individual power plants and the fuel mix[25].

[25] For all other fuels (diesel, oil, naphtha), specific CO_2 emissions are assumed to remain constant at the level of 2010.

Figure 13: Indexed baseline of specific CO_2 emissions of the power sector based on specific CO_2 emissions of individual power plant types (natural gas, hard coal and lignite) as well as an assumed trend of the fuel mix, 2006-2030



Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

The figure shows that the autonomous development of the power sector, i.e. the shift in the fuel mix (more natural gas-fired electricity generation, significant increase of renewables) and efficiency improvements of individual power plants, lead to significantly decreasing specific CO_2 emissions of the power sector from 740 g CO_2/kWh in 2010 to 401 g CO_2/kWh in 2030.

In order to assess the impact of the autonomous development of the power plant fleet on absolute CO_2 emissions, the development of the electricity generation up to 2030 needs to be estimated. The development of the electricity demand is dependent on a range of factors such as the development of economic growth, socio-economic development and the implementation of energy efficiency measures. Electricity generation has increased from 497 TWh in 2006 to 625 TWh in 2010[26], which corresponds to an annual growth of 5.9%. For this rough analysis it is assumed that this growth rate continues until 2020. Between 2020 and 2030, it is assumed that the annual growth of electricity generation can be limited to 3% due to an increased uptake of

[26] It should be noted that electricity generation is derived from the CEA dataset. Please refer to the discussion of associated uncertainty due to changing coverage over time (footnote 22).

readily available efficiency measures. In such a scenario, electricity generation would increase from 625 TWh in 2010 to 1,490 TWh in 2030 (Table 3)[27].

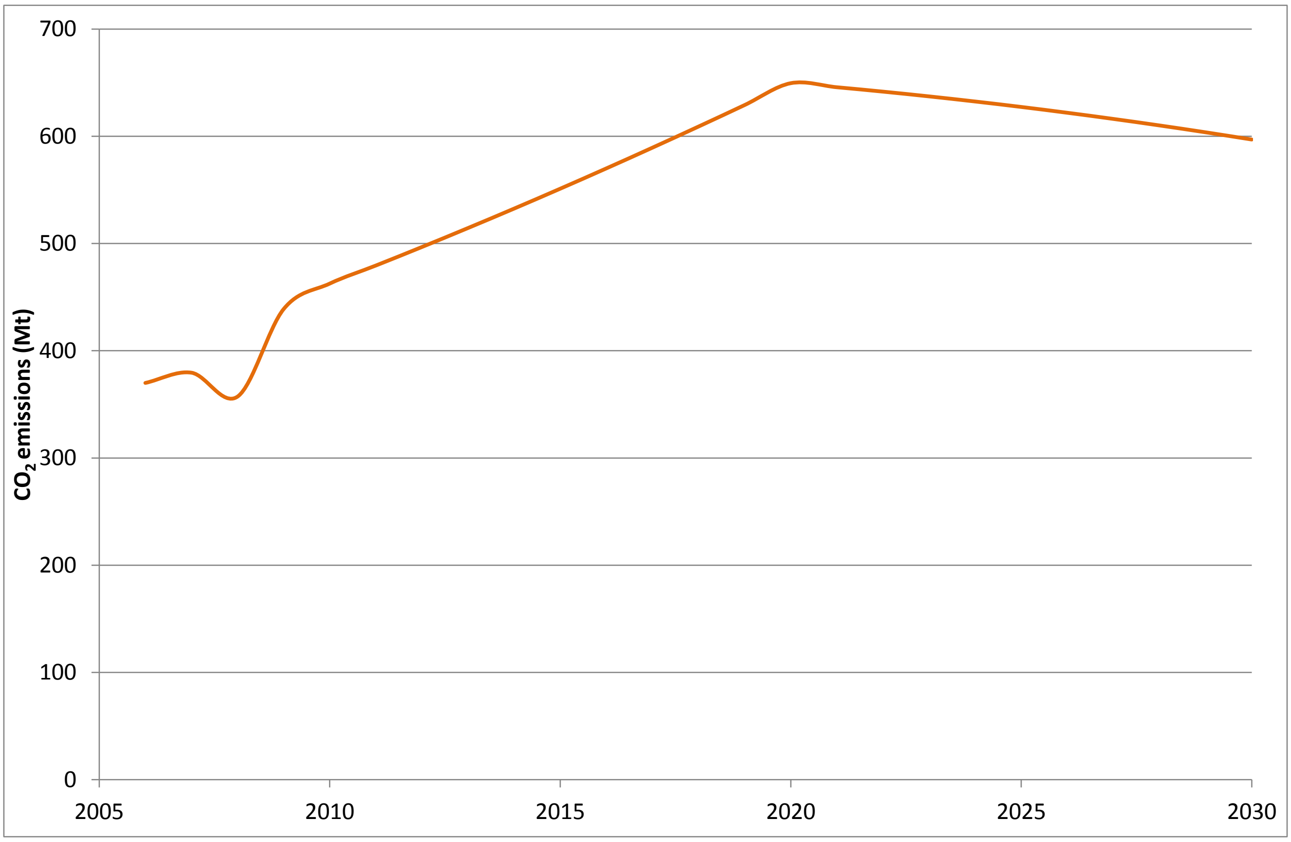
Table 3: Estimated development of the electricity generation of Indian power plants, 2006-2030

Net generation (TWh)								
2006	2007	2008	2009	2010	2015	2020	2025	2030
497	503	482	578	625	833	1.109	1.286	1.490

Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

On the basis of the indexed baseline of specific CO_2 emissions of the power sector (Figure 13) as well as on the development of the electricity generation (Table 3), absolute baseline CO_2 emissions can be calculated (Figure 14).

Figure 14: Absolute baseline CO_2 emissions based on an indexed baseline, 2006-2030



Source: Central Electricity Authority (2012a), calculations by Oeko-Institut

In such a scenario, absolute CO_2 emissions increase from 463 Mt CO_2 in 2010 to 650 Mt CO_2 in 2020. Although specific CO_2 emissions of individual power plants decrease and the share of renewables increases, the efficiency gains are more than outweighed by the significant growth of the electricity consumption. Only after 2020, absolute CO_2 emissions decrease (to 597 Mt CO_2

27 Different scenarios for the development of electricity demand are also available in Central Electricity Authority (2012b). However, forecasts reach until 2021/22 only.

in 2030) due to the increased uptake of energy efficiency measures and thus the limitation of growth of electricity consumption.

Result

This analysis demonstrates that a mere extrapolation of absolute CO_2 emissions (Figure 6) neglects important aspects of autonomous development of the power sector, namely the increased efficiency of individual power plants, fuel switch and the promotion of renewables. Also, potential (autonomous) abatement measures in other sectors (energy efficiency, expressed in yearly growth of electricity consumption) are not considered by a mere extrapolation of absolute CO_2 emissions. It can therefore be concluded that a plausible and conservative estimation of baseline emission needs to consider several key drivers at the same time. A purely technical analysis (based on benchmarks, etc.) does not lead to a robust baseline. The use of projection techniques (which allow considering a range of variables at the same time) should therefore be further explored.

5.4 Assessing baselines for the NMBM: cement sector

5.4.1 General characteristics of the sector

The cement industry is a crucial economic sector globally. Cement is produced practically in every country in the world, and is required to build the basic infrastructure needed for development. The world's total cement production reached 3.4 billion tonnes in 2011, with an average growth of 6.7% over the last 5 years (US Geological Survey 2012). The CO_2 emissions associated with cement production can be estimated at 2.72 $GtCO_2e$ in 2011.[28] In 2006, the sector's emissions represented 8% of global anthropogenic CO_2 emissions (Müller and Harnisch 2008).

Economic development has been recognized as the main driver of the cement industry. Per capita cement consumption tends to increase with income up to an income level of 15,000 USD/capita. After reaching this income level, cement consumption stabilizes (Müller and Harnisch 2008). As a result of such trend, most new production capacity needed in the next 10-20 years is expected to be installed in low- to middle-income countries. Already now, over half of global cement production takes place in China, and about ¾ of it occurs in just 12 developing countries (Lee et al. 2011).

Cement production involves several GHG (mainly CO_2) emission sources. About 50% of total emissions occur in the form of process (non-energy related) CO_2 emissions from limestone calcination; 40% occur through energy (coal) consumption in clinker production; the rest comprises mainly indirect emissions from electricity consumption (e.g. for grinding of raw material and clinker), and emissions from transportation. On average, 0.8 tCO_2 are emitted per tonne of cement (Lee et al. 2011). Such diversity of emission sources implies that, according to the IPCC guidelines for GHG inventories (IPCC 2006), cement sector emissions need to be accounted for in several IPCC sector definitions: process emissions are accounted within the IPCC 2 A 1 category (mineral industry – cement production); direct energy emissions are considered in the

28 Based on an estimated CO_2 intensity of 0.8 tCO_2e/t cement (Lee et al. 2011) and a production level of 3.4 Gt cement in 2011.

1 A 2 f category (manufacturing industries and construction: non-metallic minerals); electricity emissions are included in the 1 A 1 a category (main activity electricity and heat production); transport emissions are considered within the 1 A 3 sector (transport). This already illustrates the challenges existing in defining "sectors" for a NMBM.

At the same time, the existence of all these emission sources gives place to several mitigation opportunities, such as the use of alternative raw materials for clinker production in kilns, the use of alternative kiln fuels, energy efficiency measures including waste heat recovery, an increased blending of clinker with cementitious materials, and, potentially, carbon capture and storage (Lee et al. 2011). With respect to fuel use, while similar fuels are generally used worldwide (usually coal), a mix with waste or biomass is possible, depending on their availability and on the applicable legal framework. In terms of energy efficiency, nowadays similar production technologies are applied worldwide in new plants, with a limited number of equipment manufacturers supplying the market (Hayashi et al. 2010). However, as production technology has become more efficient over time, plant vintage matters, and, particularly for existing installations, technology types (e.g. wet versus dry kilns) are also relevant. While using alternative materials to produce clinker or to mix with it is a theoretically available option to reduce emissions, it strongly depends on local availability of appropriate materials.

A potential sectoral baseline for cement therefore needs to explicitly deal with following specific design elements with respect to its level of aggregation:

- **Process:** Consideration of two types of processes: dry and wet kilns (especially if the baseline is to be applied to retrofits of existing kilns, as new kilns usually apply the dry technology). If electricity emissions are included in the baseline, differentiation could be included in terms of plants with or without captive power plants.
- **Product:** Baselines could be set for clinker or for cement production. If set for cement, a potential market fragmentation could exist in terms of the blending ratio of clinker with alternative cementitious materials.
- **Time:** Consideration of autonomous efficiency improvements over time – estimates for the US put such autonomous improvement at between 0.5% and 1% per year, and relate them to an increased capacity of dry process kilns, energy efficiency improvements, and lower clinker to cement ratios (Worrell and Galitsky 2004).
- **Space:** Differentiation needed in terms of availability of alternative fuels, raw and blending materials, and of legal framework to allow the use of such materials. If electricity emissions are included in the baseline, differentiation could be needed in terms of the relevant electricity grids.

In the following section, we present an example about how a baseline for the cement sector could be developed on the basis of publicly available top-down (aggregated) data for an advanced developing country. As the particular local conditions existing in the case study will be fixed for this specific country, the analysis will not discuss the issues related to level of aggregation at length, but rather focus on the other design elements for sectoral baselines reviewed above: reference data, dynamics and updating, metrics and stringency level.

5.4.2 Case study of sectoral baselines in the cement sector

For the case study of the cement sector, we rely on the cement production and CO_2 emissions data that has been collected by the World Business Council for Sustainable Development (WBCSD)'s Cement Sustainability Initiative (CSI), which is publicly available on its website (CSI 2012). Due to confidentiality reasons, the publicly available data does not display production or emissions data per plant, nor vintage information of individual plants. Hence, only aggregated data (at the region level) is available for the years 1990, 2000, and 2005 onwards. This data will be used to illustrate how top-down, aggregated emission baselines for a whole sector up to the year 2030 could be established. For the case study, we have chosen to focus on the Indian cement sector because data for this country is reported separately by CSI, and has a relatively high coverage because complementary data from industry organisations is available, and because Indian cement production is, despite its already quite high energy efficiency, a large (and growing) contributor to GHG gases.

India is the second largest cement producer in the world, with a share of about 6% of global production (Parliament of India 2011). The industry comprises 154 large cement plants with an installed capacity of 230.8 million tonnes (Parliament of India 2011)[29] as well as over 365 mini plants with an installed capacity of about 11.1 million tonnes (Indian Brand Equity Foundation 2011). Cement production has grown at an average rate of over 8% over the last 5 years (Reserve Bank of India 2011), and emitted about 130 $mtCO_2e$ in the year 2007, which represented about 6.8% of India's greenhouse gas emissions[30] (Ministry of Environment and Forests 2010). Most of the country's cement production is consumed locally, with just a small percentage being exported (CMA 2010). There are no reports of cement or clinker being imported.

In terms of ***process***, the Indian cement industry hence comprises both new state-of-the-art plants using the efficient dry process technology, and smaller and inefficient wet process kilns. Production from the large plants accounts for about 97% of total production. While detailed statistics for small plants do not seem to be available, estimates show that production from small plants has not significantly grown in the last 15 years, remaining around 6 million tonnes per year.

With respect to ***products***, mainly three types of cement are produced. Portland Pozzolana Cement has a share of 67% of production, followed by Ordinary Portland Cement (25%) and Portland Slag Cement (8%). The present share of blended cement (75%) is expected to continue increasing in the future. Clinker substitutes for such blending are still available in large quantity: The Parliament of India (2011) estimates that currently 34 million tonnes of fly ash and 8 million tonnes of blast furnace slag are used as clinker substitutes per year. According to their estimations, 130 million tonnes of fly ash and 13 million tonnes of blast furnace slag are available each year. Another estimate cites a total of 161.5 million tonnes of these and other alternative cementitious materials per year (Pahuja 2008). However, due to increasing demand, also from competitive uses such as brick manufacturing, these originally free waste products have

[29] Other sources cite 139 large plants with a capacity of 234.3 million tonnes per year (Indian Brand Equity Foundation 2011). Large plants are those with an installed capacity above 1 million tonnes/year.

[30] Without considering indirect emissions from electricity use, and without counting LULUCF.

now become a priced commodity, which represents a cost barrier for a wider use(Parliament of India 2011). Technically, high blending levels are possible without affecting the performance of cement. In practice, some countries have achieved a clinker-to-cement ratio (CCR) of around 0.7, with Brazil reaching even 0.65 (in comparison, the current ratio in Indian large plants is about 0.77); some cement blends reach a CCR of 0.25 (Müller and Harnisch 2008; CMA 2010; Graus et al. 2011).

The CSI data covers 72 plants from 8 companies operating in India, which represents about 50% of current total production (see Table 4). The small number of plants and large coverage in terms of production suggests that the database only contains information from large production plants. In terms of process, the database includes only dry kilns, of which between 93% and 100% include a preheater and a precalciner, and 0-7% include only a preheater. In terms of fuel, mostly fossil fuels are used, but their share has decreased from about 100% in the years 1990 and 2000 to 97.9% in 2010, being replaced mostly by waste materials, but also by biomass.[31] Similarly, the use of blending materials has increased from 13.6% in 1990 to 29.2% in 2010.

The data reports ***emissions*** from the calcination process and from fossil fuel combustion. Emissions from biomass and waste combustion are considered to be zero. Indirect emissions from electricity consumption are not included. While the CSI data includes an electricity consumption indicator (kWh per tonne of cement), finding an appropriate emissions factor for electricity consumption is problematic as an increasing number of plants has captive power production (probably based on co-generation or waste heat recovery). This is a significant drawback of the data, as some studies have pointed out that, while new cement plants usually incorporate state of the art clinker kilns, there is higher variation in the electricity-consuming equipment installed (e.g. grinding units). Thus, in new installations, there may be more scope for achieving efficiency gains from electricity consumption in grinding mills than from fuel combustion in clinker kilns (Ruth et al. 2000). In addition, 30% to 40% of total heat input in cement plants is released as waste heat. In India, the cement sector has an estimated potential of 400 MW electricity generation from co-generation, but so far only 13.5 MW are in operation and 71.5 MW under construction (frequently as part of CDM projects). Due to the imported technology, capital costs of co-generation are still higher than those of coal-fired power plants. In addition, state governments impose a duty on captive power generation and also demand a payment for grid power use even if the plants are self-reliant. This reduces the competitiveness of co-generation also in terms of operation costs (Parliament of India 2011).

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31 While different types of fossil fuels have different carbon intensities, the CSI database does not report what types of fossil fuels are used in cement production in India. Data from the CMA show that besides coal, lignite and petroleum coke have been used since the early 1990s in shares ranging from 1 to 13% of total fuel consumption.

Table 4: Cement statistics for India, CSI database and official statistics compared

Year	CSI database				CMA statistics [a]		CSI data coverage (production)	CSI data coverage (plants)
	Cement production (1000 tonnes)	Plants	Dry kilns with preheater and precalciner[b]	Clinker to cement ratio (t clinker / t cementitious)	Cement production (1000 tonnes)	Large plants		
1990	18'700	25	100.0%	0.864	48'900		38.2%	
2000	49'600	48	100.0%	0.852	100'110		49.5%	
2005	70'700	54	93.0%	0.778	147'810		47.8%	
2006	76'400	54	93.0%	0.749	161'640		47.3%	
2007	82'500	57	94.0%	0.728	174'310	136	47.3%	41.9%
2008	89'100	59	93.0%	0.713	187'610	145	47.5%	40.7%
2009	103'000	65	100.0%	0.715	206'940	156	49.8%	41.7%
2010	106'000	72	100.0%	0.711	215'560	161	49.2%	44.7%

[a] CMA data are based on financial years from 1 April to 31 March.
[b] The remaining plants are dry kilns with a preheater only.

Sources: CMA (2010); CSI (2012). For year 2010: ACC Limited (2012); Ambuja Cements Ltd. (2012); CMA (2012).

In addition, basic socioeconomic data (GDP, GDP per capita and population) and current industry statistics will be used for projecting future cement production levels. The historic socioeconomic data up to 2010 was obtained from the World Development Indicators (World Bank 2012), and future projections up to 2030 were gathered from the US Energy Information Administration's International Energy Outlook Reference Case projections (EIA 2011). Historic cement production levels were obtained, for the years 1981-1988, from the Reserve Bank of India (2011), and for the years 1989-2009 from the Cement Manufacturers' Association (CMA 2010).

The main factors influencing direct (non-electricity) emissions from the cement sector are fuel consumption and thermal efficiency in the clinker production process, and the blending ratio. Accordingly, the following types of baselines could be proposed:

- Indexed baseline based on CO_2 emissions per unit of cement production: This baseline would account for the effect of both the clinker production process and blending of clinker with other cementitious materials on emission levels.
- Indexed baseline based on CO_2 emissions per unit of clinker production: This baseline would incorporate only the effect of the clinker production process on emission levels.
- Absolute emissions baseline based on historical emissions and trends: This baseline would implicitly include also the size of the industry as a factor affecting emission levels.

These baselines will be compared with an hypothetical emissions goal for the cement sector in the year 2030 based on the CSI's Cement Technology Roadmap (WBCSD and IEA 2009): 0.426 tCO_2/t cement, which represents a 36% reduction with respect to the emissions intensity of Indian cement production in 2005 (as covered by the CSI database).

Indexed baseline based on emissions per unit of cement production

When emissions levels are indexed with respect to cement production, the thermal efficiency in the clinker production process, the amount of fossil fuels in the fuel mix, and the blending ratio of clinker with other materials (CCR) influence emission levels.[32] Hence, projections of future emission levels should ideally take these predictors into account. The slightly longer time series available for cement emissions than for power emissions allows us to display the effect of different types of projections into the future on the shape of the baseline. To illustrate the effect of using different projections and predictors on estimated future emission levels, we use the available historical data to generate four types of projections, as detailed in Table 5. Source: Authors' own calculations based on CSI (2012) Ghosh and Chandrasekhar (2009)

Figure 15 presents the results of the different projections, and illustrates how different ways of estimating a baseline on the basis of historic data may yield very different results. In all the projections, the trend is towards lower emissions per unit of cement production. However, the longer the time period projected, the more divergent the results are, hence the higher the uncertainty of the projections. According to these projections, the direct CO_2 emissions from cement production in India in the year 2020 may be anywhere between 0.483 and 0.578 tCO_2/t cement. It is interesting to note that the most ambitious projections (in terms of less emissions per unit of cement) are obtained by using a simple linear extrapolation of the current trend. In the case of the Indian cement sector, energy efficiency is already among the highest in the world. Compared to the projections on the basis of realistic efficiency, fuel mix and blending achievements up to 2030, the simple linear projection of current trends would clearly require quite high blending or fuel shift percentages in the future, which may become challenging.

Table 5: Baselines based on projections of indexed emissions per unit of cement production: assumptions

Projection	Rationale and assumptions
Linear extrapolation of historical emissions on the basis of all the existing indexed emissions data	Continuation of historical emission trends.
Linear extrapolation of historical emissions on the basis of the indexed emissions data for the last 6 years	Continuation of historical emission trends, but using only the most recent data with a continuous time series. This would avoid potential bias due to missing data and due to longer term changes in the emission trends.
Linear projection from the last data point assuming an autonomous 1% annual improvement in emissions performance	Following historic improvements cited by the literature. This improvement factor would account for both energy efficiency improvements and changes in the fuel mix or blending proportions.

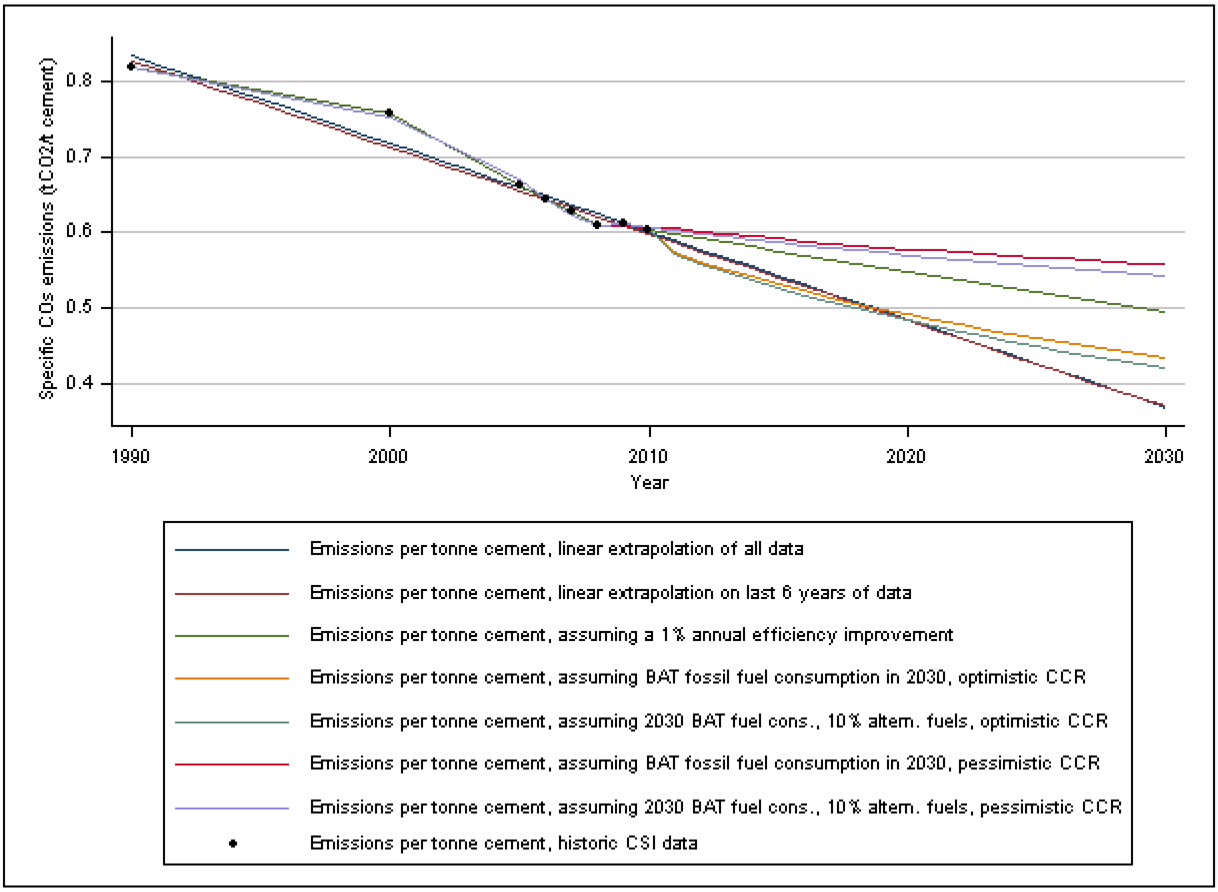
[32] As described above, the CSI data does not report indirect emissions from electricity consumption, so that this emissions source will not be considered in our analysis.

Projection	Rationale and assumptions
Linear regression with respect to projected fossil fuel consumption and clinker to cement ratio (CCR)	Relates cement emissions to its underlying causes: the use of fossil fuels in clinker production (influenced by energy efficiency improvements and by the use of biomass or waste as fuels) and the level of blending of clinker with other cementitious materials. Four scenarios about the future projection of fuel use and CCR are modelled:
	- In 2030, fuel consumption reaches best available technology (BAT) levels, but alternative fuels are not used. Fossil fuel consumption hence evolves linearly from current levels (3097 MJ/t clinker in 2010) to 2717 MJ/t clinker in 2030. An optimistic CCR of 0.57 is reached in 2030.
	- In 2030, fuel consumption reaches BAT levels, and 10% alternative fuels are used. Fossil fuel consumption evolves linearly from current levels to 2459 MJ/t clinker in 2030. An optimistic CCR of 0.57 is reached in 2030.
	- In 2030, fuel consumption reaches BAT levels, but alternative fuels are not used. Fossil fuel consumption evolves linearly from current levels to 2717 MJ/t clinker in 2030. A pessimistic CCR of 0.69 is reached in 2030.
	- In 2030, fuel consumption reaches BAT levels, and 10% alternative fuels are used. Fossil fuel consumption evolves linearly from current levels to 2459 MJ/t clinker in 2030. A pessimistic CCR of 0.69 is reached in 2030.[33]

Source: Authors' own calculations based on CSI (2012) Ghosh and Chandrasekhar (2009)

[33] BAT thermal energy consumption levels were obtained from (Indian Brand Equity Foundation 2011). Assuming BAT in 2030 means that existing old installations will be replaced or retrofitted to achieve the highest existing efficiency levels by 2030. With the rising costs of fuels, such an assumption is plausible even without policy intervention. The assumption on alternative fuels reaching 10% by 2030 is relatively pessimistic, if we consider that some European countries have already managed to source up to 47% of thermal energy from alternative fuels (Bischoff 2008), and individual plants up to 98% (WBCSD and IEA 2009). WBCSD and IEA (2009) expect that in developing countries, rates of substitution of 10-20% on average can be achieved by 2030. Different types of waste fuels are available in large quantities in India: Rajasekar (2008) cites a potential for heat substitution in clinker production of 47% from hazardous waste, municipal solid waste and tires in India. Trial runs in several cement plants with effluent treatment plant sludge, tar waste from petroleum industries, used tires, refinery sludge and paint sludge have had positive results (Bischoff 2008). However, there are regulatory barriers to the use of hazardous wastes for cement production, and the use of biomass as fuel is being adopted slowly (Kumar 2008). Other factors also influence the decision to adopt alternative fuels, such as the proximity of the fuel source to the plant, the sustainability of the supply, type of manufacturing process and compatibility of the fuel with it, and the infrastructural facilities needed to handle the alternative fuel (Pahuja 2008).

Figure 15: Baselines based on projections of indexed emissions per unit of cement production



Source: Authors' own calculations based on Ghosh and Chandrasekhar (2009); CSI (2012)

In order to be able to estimate total emission levels for an indexed baseline, the baseline needs to be related to total cement production levels. Usually, such activity data is monitored over time, so that the absolute emissions are not known in advance. In this case study, in order to illustrate the range of absolute emission levels that would be covered by the indexed baselines estimated above, we generate future cement production projections on the basis of historic industry data (CMA 2010; Reserve Bank of India 2011) and assuming different scenarios, as detailed in Table 6.

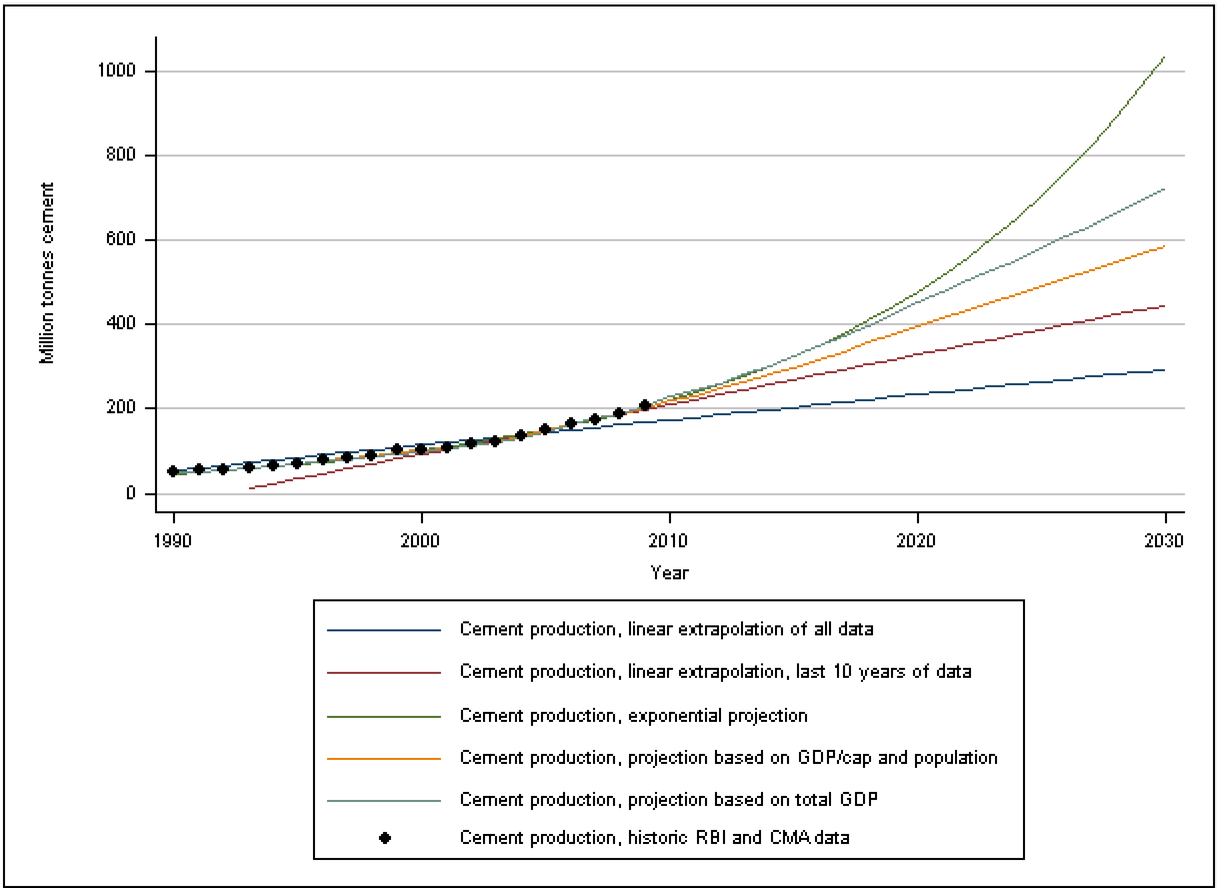
Table 6: Projections of cement production up to 2030: assumptions

Projection	Rationale and assumptions
Linear extrapolation of historical production data	Continuation of historical cement production trends.
Linear extrapolation of historical production data (only last 10 years)	Continuation of historical production trends, but using only the most recent data. This would avoid potential bias due to longer term changes in the underlying economic development trends.

Projection	Rationale and assumptions
Linear extrapolation of historical production data	Continuation of historical cement production trends.
Exponential projection of historical production data	The historical trend shows an exponential growth of cement production in India. An exponential projection is better suited to reflect this trend than a simple linear one as above.
Linear regression with respect to projected GDP per capita and population levels	Relates cement production to its underlying causes: economic and population growth. GDP per capita and population projections follow the reference case in EIA (2011). Different specifications for the regression were tested and the one with the best fit was used: $cement\_prod = \alpha + \beta_1\ GDPcap + \beta_2\ population + \beta_3\ population^2$
Linear regression with respect to projected total GDP	Relates cement production to its underlying causes: economic and population growth. Total GDP summarizes the effect of GDP per capita and population in a single variable. It is projected as in the reference case in EIA (2011). Different specifications for the regression were tested and the one with the best fit was used: $cement\_prod = \alpha + \beta_1\ GDP$

Source: Authors' own calculations based on CMA (2010); EIA (2011); Reserve Bank of India (2011); World Bank (2012)

Figure 16: Projections of Indian cement production up to 2030



Source: Authors' own calculations based on CMA (2010); EIA (2011); Reserve Bank of India (2011); World Bank (2012)

Figure 16 presents the results of the different cement production projections, and makes clear that the range of different results is even larger than in the case of indexed emissions. In the year 2020, cement production is projected to be anywhere between 234 and 478 million tonnes, up from 207 million tonnes reported for the year 2009. This uncertainty in production levels is implicitly included in baselines that are based on absolute emission levels, which supports the idea that indexed baselines are better suited for countries with uncertain future growth projections. It is likely that the highest projection displayed in Figure 16 (exponential projection) is not realistic, as it would imply reaching a production level of 698 kg cement per capita in 2030, which is much higher than current European consumption (450 kg/cap). IEA expects that current Indian annual consumption of cement (120 kg/cap) will raise to 450 kg/cap until 2050, to match current European consumption (Tam 2008).

Assuming that production levels in the year 2020 will be at the average between all the shown projections (378 million tonnes cement), total cement-related direct emissions in India will amount to 182.6 – 218.5 mtCO_2 in the year 2020.

Indexed baseline based on emissions per unit of clinker production

When emissions levels are indexed with respect to clinker production, only the thermal efficiency in the clinker production process and the amount of fossil fuels in the fuel mix influence emission levels. We generate the projections described in Table 7.

Table 7: Baselines based on projections of indexed emissions per unit of clinker production: assumptions

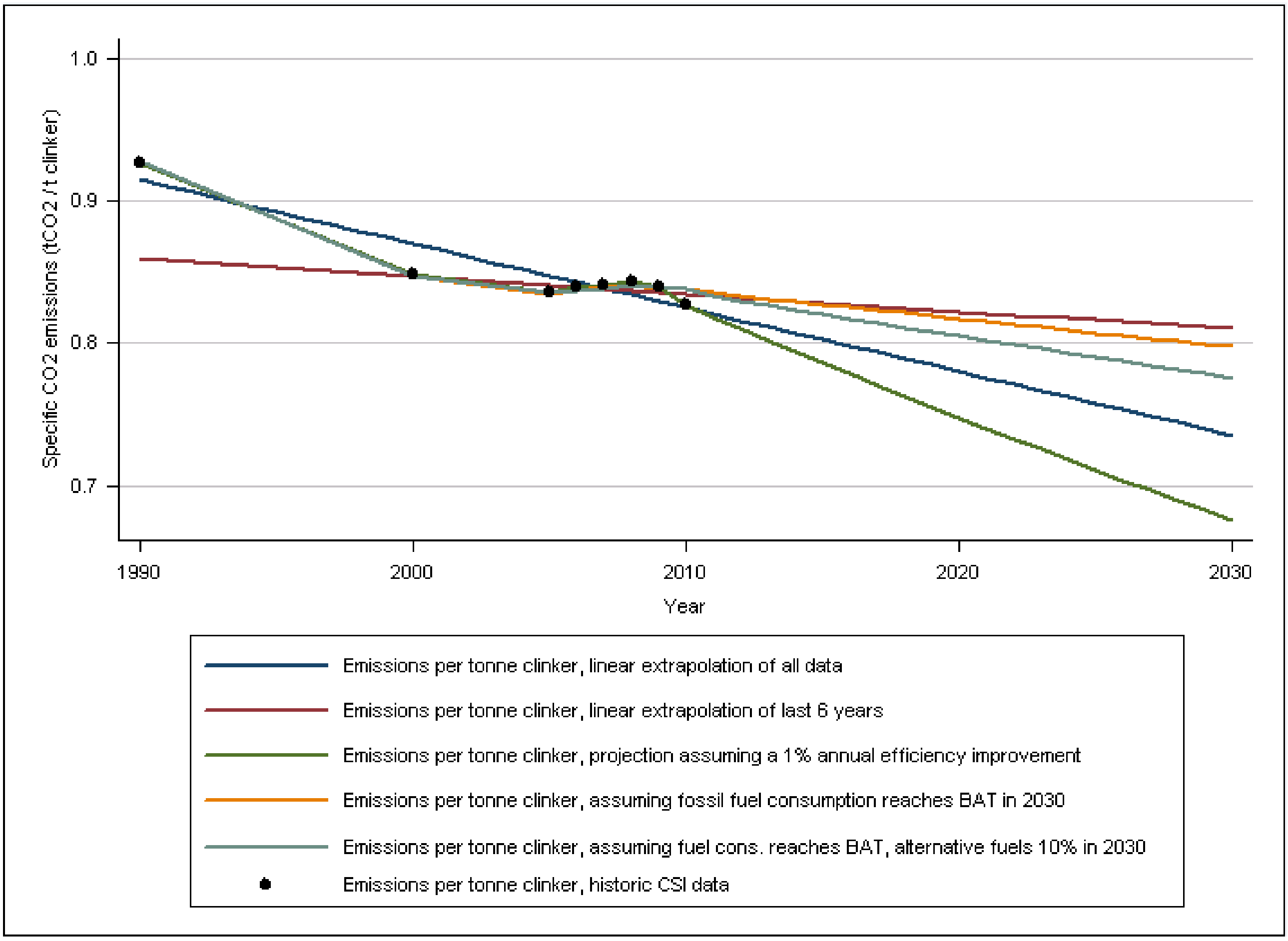
Projection	Rationale and assumptions
Linear extrapolation of historical emissions on the basis of all the existing indexed emissions data	Continuation of historical emission trends.
Linear extrapolation of historical emissions on the basis of the indexed emissions data for the last 6 years	Continuation of historical emission trends, but using only the most recent data with a continuous time series. This would avoid potential bias due to missing data and due to longer term changes in the emission trends.
Linear projection from the last data point assuming an autonomous 1% annual improvement in emissions performance	Following historic improvements cited by the literature. This improvement factor would account for energy efficiency improvements and changes in the fuel mix.
Linear regression with respect to projected fossil fuel consumption	Relates cement emissions to its underlying cause: the use of fossil fuels in clinker production (influenced by energy efficiency improvements and by the use of biomass or waste as fuels). The blending level does not play any role in this indicator. Two scenarios are modelled: - In 2030, fuel consumption reaches best available technology (BAT) levels, but alternative fuels are not used. Fossil fuel consumption hence evolves linearly from 3097 MJ/t clinker in 2010 to 2717 MJ/t clinker in 2030. - In 2030, fuel consumption reaches BAT levels, and 10% alternative fuels are used. Fossil fuel consumption evolves linearly from current levels to 2459 MJ/t clinker in 2030.

Source: Authors' own calculations based on Ghosh and Chandrasekhar (2009); CSI (2012)

In Figure 17 we see the results of the projections on emissions per tonne of clinker produced. Here again we have a trend towards lower emission intensities, but quite a large divergence between the different results. According to the results, business-as-usual direct CO_2 emissions per tonne of clinker production will be between 0.748 and 0.822 tCO_2/t clinker in the year 2020.

To estimate future absolute emission levels on the basis of this set of indexed baselines, we project clinker production levels into the future by using the projections of cement production presented above and assuming an optimistic and a pessimistic evolution of the clinker-to-cement ratio as presented in Table 5. In the optimistic case, CCR would reach 0.61 in 2020 and 0.57 in 2030; in the pessimistic one, it would reach 0.70 in 2020 and 0.69 in 2030. Under these assumptions, clinker production would range from 143.2 to 333.6 million tonnes in 2020, with an average production level of 247.2 million tonnes. Assuming this average production level, total clinker-related direct emissions in India will amount to 184.9 – 203.4 $mtCO_2$ in the year 2020.

Figure 17: Baselines based on projections of indexed emissions per unit of clinker production



Source: Authors' own calculations based on Ghosh and Chandrasekhar (2009); CSI (2012)

Absolute emissions baseline based on historical emissions and trends

So far, we have projected future emission baselines on the basis of indexed emissions, which are independent of the production level. In the climate regime, however, emission targets have usually been expressed in absolute terms. In this section we therefore illustrate how absolute emissions baselines could be estimated on the basis of historical data and projections. To avoid distortions caused by the changing coverage of the CSI database over time, the CSI data on absolute emissions have been scaled so that they represent a coverage of 100%. The projected baselines and their assumptions are explained in Table 8.

Figure 18 shows the results of the projections. It is interesting to see that the absolute level of emissions is largely determined by the assumptions about future cement production levels, and much less by assumptions about how the industry's technology (fossil fuel use and blending ratio) will evolve.

The projections of absolute emissions lead to an estimated emissions from total cement production in India of 131.4 to 253.6 mtCO_2 in the year 2020.

Table 8: Baselines based on projections of absolute emissions up to 2030: assumptions

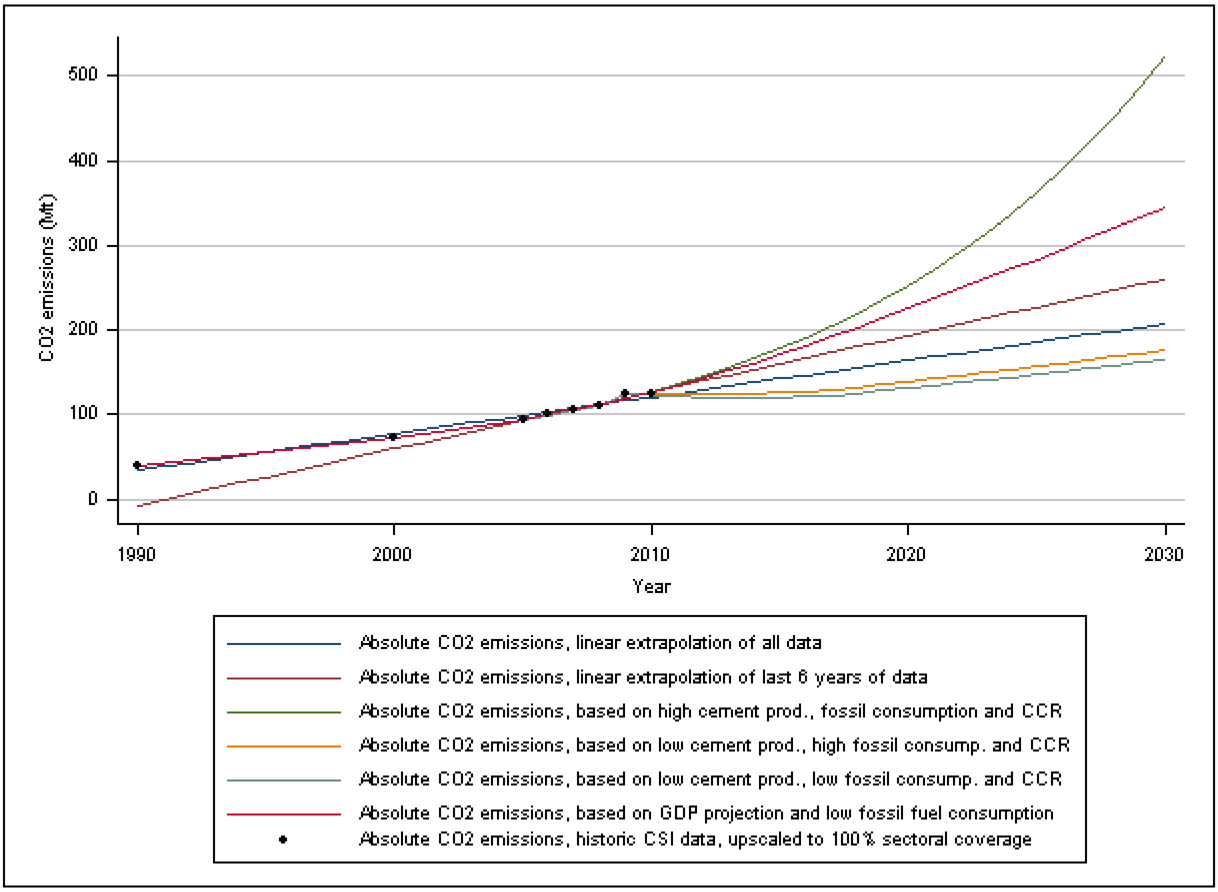
Projection	Rationale and assumptions
Linear extrapolation of historical absolute emissions data	Continuation of historical emissions trends.
Linear extrapolation of historical absolute emissions data (only last 6 years)	Continuation of historical emissions trends, but using only the most recent data. This would avoid potential bias due to missing data and longer term changes in the emission trends.
Linear regression with respect to projected cement production levels, fossil fuel consumption and CCR	Relates the absolute emissions to its underlying causes: the size of the industry, the use of fossil fuels in clinker production, and the amount of clinker replaced by substitutes. Different scenarios are created: - High cement production, high fossil fuel use and CCR: Assumes the exponential projection of cement production from Table 6 and Figure 16, fossil fuel consumption reaching BAT in 2030, CCR reaching 0.69 in 2030. - High cement production, low fossil fuel use and CCR: Assumes the exponential projection of cement production from Table 6 and Figure 16, fuel consumption reaching BAT in 2030 with 10% alternative fuels, CCR reaching 0.57 in 2030.[34] - Low cement production, high fossil fuel use and CCR: Assumes the linear projection of cement production from Table 6 and Figure 16, fossil fuel consumption reaching BAT in 2030, CCR reaching 0.69 in 2030. - Low cement production, low fossil fuel use and CCR: Assumes the linear projection of cement production from Table 6 and Figure 16, fuel consumption reaching BAT in 2030 with 10% alternative fuels, CCR reaching 0.57 in 2030.

[34] Both high cement production scenarios had very similar results in terms of projected absolute emission levels. Hence, only one of them is shown in Figure 18.

Projection	Rationale and assumptions
Linear regression with respect to projected total GDP and fossil fuel consumption	Relates cement production to its underlying causes: economic and population growth. Total GDP summarizes the effect of GDP per capita and population in a single variable. Two scenarios are modelled: - High fuel consumption: assumes fossil fuel consumption reaching BAT in 2030. GDP projection follows the reference case in EIA (2011). - Low fuel consumption: assumes fuel consumption reaching BAT in 2030 and 10% substitution with alternative fuels. GDP projection follows the reference case in EIA (2011).[35]

Source: Authors' own calculations based on Ghosh and Chandrasekhar (2009); CMA (2010); EIA (2011); Reserve Bank of India (2011); CSI (2012); World Bank (2012)

Figure 18: Baselines based on projections of absolute emissions



[35] Both scenarios had very similar results in terms of projected absolute emission levels. Hence, only one of them is shown in Figure 18.

Source: Authors' own calculations based on Ghosh and Chandrasekhar (2009); CMA (2010); EIA (2011); Reserve Bank of India (2011); CSI (2012); World Bank (2012)

Comparison to hypothetical emissions goal

The WBCSD and IEA have proposed a technology roadmap for the cement industry with emission reduction goals up to 2050 (WBCSD and IEA 2009). We take their 2050 goal under a low cement demand scenario as an appropriate hypothetical target for the Indian cement industry in 2030, because the Indian cement industry has already begun a transition towards higher efficiency and stronger use of clinker substitutes, with current thermal efficiency of 3.1 GJ/t clinker, and clinker-to-cement ratio of 71% (as reported by the CSI database). Such a good performance can be explained partly because the CSI database does not cover the part of the industry that is less efficient; in addition, the large-scale Indian cement plants are already among the most efficient in the world.

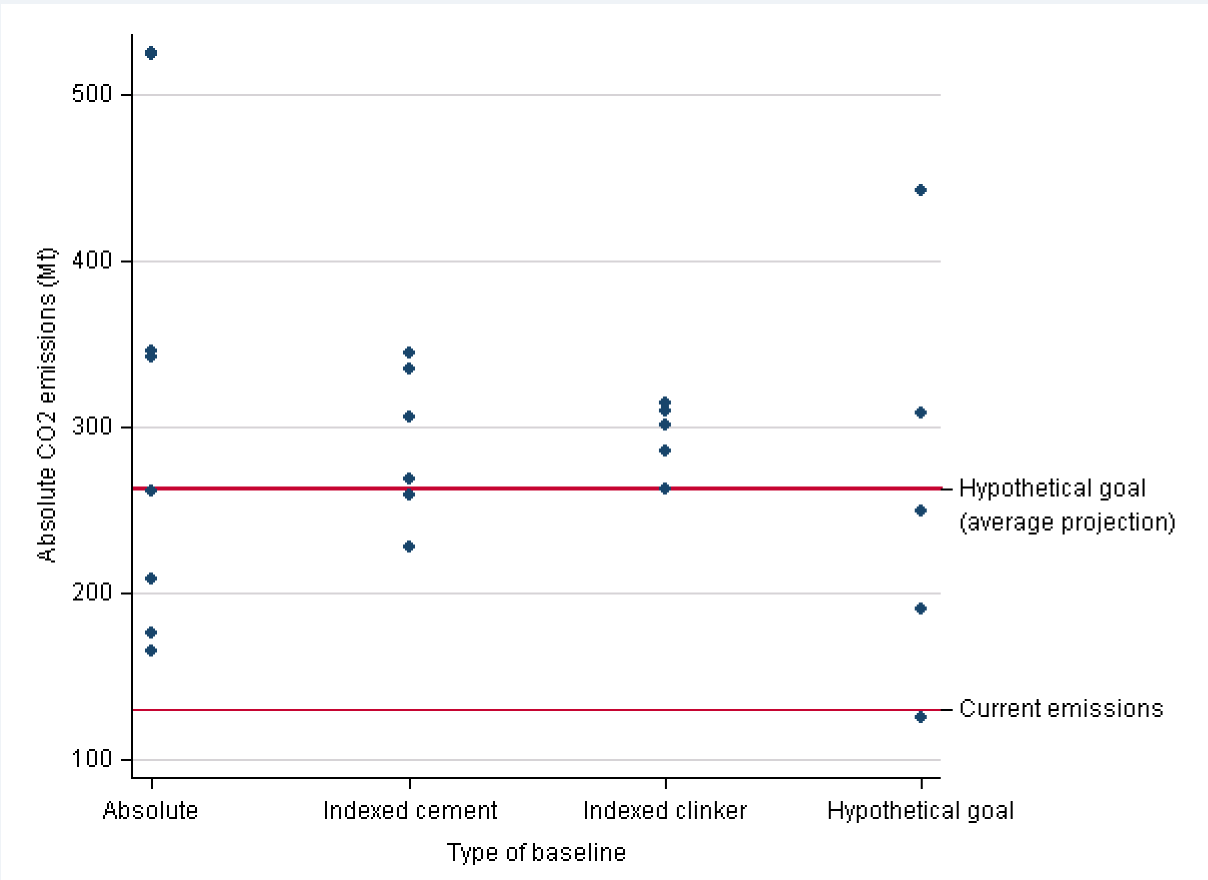
The WBCSD-IEA target implies reaching an emissions intensity of 0.426 tCO_2/t cement, which is to be achieved through a combination of BAT in terms of thermal energy efficiency (3.2 GJ/t clinker), a share of alternative fuels of 37%, a clinker-to-cement ratio of 71%, and a number of carbon capture and storage (CCS) plants in commercial operation. Compared to the current performance of the Indian cement industry covered by the CSI database, such a hypothetical goal means a substantial change in the fuel mix used, and probably also some application of CCS.

Such a goal implies a reduction in emissions intensity of about 36% with respect to the performance of India's cement production in 2005 (as covered by the CSI database). We assume it can be achieved by 2030.

Our projections based on indexed emissions from cement production indicate that in 2030, BAU emissions should be in the range between 0.368 and 0.557 tCO_2/t cement. The comparison indicates that the hypothetical target is in line with the lowest end of the BAU projections we have made previously.

Figure 19 shows how this hypothetical goal compares to all our estimated baseline emissions in 2030 in absolute emission terms. The dots represent the estimated level of emissions under the different assumptions for each baseline type. Besides the three types of baselines we have estimated, we also show what ranges of absolute emissions would be achieved with the hypothetical emissions intensity goal if different projections of future cement production are used. The horizontal lines show both the current Indian cement emissions (as of year 2007), and the emissions under the hypothetical goal for an average cement production projection. The comparison between the indexed baselines and the average hypothetical goal (red line) shows that the hypothetical goal lies at the lower end of our indexed BAU baseline projections. As discussed above, some of these projections may be unrealistic: the lowest "indexed cement" projection assumes a linear trend in reduction of emissions intensity in an industry that is already quite efficient; the second-to-lowest assumes reaching BAT in fuel consumption by 2030, 10% of alternative fuel use and an optimistic clinker-to-cement ratio of 57%. While stronger ambition might still be possible, the hypothetical goal already makes sure that emission reductions are achieved below the most credible BAU scenarios presented. The graph also illustrates that the uncertainty of future projections is large, especially when projections of cement production levels are included (as has been done in the absolute type of baseline and in the hypothetical goal spread to the right). Finally, it also shows that Indian BAU total emissions from the cement sector are expected to grow significantly due to the expected growth in the sector, even if positive trends in energy efficiency, changes in the fuel mix and cement blending are considered.

Figure 19: Comparison of estimated baselines with political emissions goal in the year 2030



Source: Authors' own calculations based on Ghosh and Chandrasekhar (2009); CMA (2010); EIA (2011); Reserve Bank of India (2011); CSI (2012); World Bank (2012)

5.5 Assessing baselines for the NMBM: buildings sector

5.5.1 General characteristics of the sector

About 30 to 40% of global primary energy is used in residential, commercial and institutional buildings. According to the 4th IPCC report (Levine et al. 2007), direct greenhouse gas emissions from the buildings sector amounted to about 5 Gt CO_2eq in the year 2004; of this total, 3 Gt were CO_2 emissions. If indirect emissions from electricity use are included, CO_2 emissions reached 8.6 Gt/year, which represents almost one quarter of total global CO_2 emissions. The sector's CO_2 emissions, including indirect emissions from electricity, grew by about 2% per year globally between 1971 and 2004. Halocarbons (CFCs, HCFCs and HFCs) represent more than 15% of total GHG emissions from buildings, and are caused mainly from the use of refrigerators, air conditioners and insulation.

Levine et al. (2007) estimate an emissions reduction potential of about 3 $GtCO_2$ in developing countries by 2030. The main drivers of emissions growth in these countries will be the high demographic growth, urbanization trends and economic development. Using a bottom-up engineering-economics model of energy consumption from appliances and lighting in residential and commercial buildings up to 2030, McNeil et al. (2008) find that, if current best energy efficiency practices were adopted globally, cumulative CO_2 emissions from 2010 to 2030 could be reduced by 21.3 Gt. Regionally, Centrally Planned Asia (China, Cambodia, Laos, North Korea, Mongolia and Vietnam) has the highest mitigation potential, followed by the rest of Asia. In the residential sector, refrigeration and lighting have the greatest potential for emission reductions, while in the commercial sector most reductions can be achieved in space cooling and lighting.

However, this high mitigation potential from the buildings sector has so far not been tackled by the CDM despite approval of several baseline methodologies in the last years. Only projects and programmes to replace traditional incandescent lighting by energy-saving bulbs have been meaningfully included. In addition, a few recent projects aim at introducing efficient cooking stoves in poor countries. The sectoral approach for a NMBM could allow for moving from such single-measure projects to whole-building ones. Minimising energy consumption in a building requires that the building as a whole is optimised by addressing as many as possible of its components at the same time: building form, orientation, envelope, glazing, mechanical and electrical systems, and appliances. Such system-thinking can lead to positive synergies in reducing energy consumption and thus emissions (Hayashi et al. 2010).

Setting meaningful emission baselines for the buildings sector represents a critical challenge, due to the high complexity of the sector. First, the buildings sector can be decomposed into two large sub-sectors: (i) residential and (ii) commercial / institutional buildings. Energy consumption patterns differ largely among them, so that baselines need to be distinguished between these types of buildings.

But further disaggregation is also possible. Within residential buildings, one can differentiate between single-family and multi-family buildings. Within commercial buildings, a study about energy use in commercial and institutional buildings in Canada in the year 2000 distinguished between following types of uses (Natural Resources Canada 2003):

- Commercial and institutional accommodation
- Entertainment and recreation
- Office
- Food retails
- Non-food retails
- Food service
- Non-food service
- Shopping malls
- Warehouse / wholesale
- Administration
- Education
- Health care

- Public assembly.

The study shows that buildings devoted to these different types of activities have very different energy intensity levels (defined as energy consumption per unit of floor space). Due to the interrelations between this and other factors influencing energy consumption, it is however very difficult to establish any clear causal relationship (Natural Resources Canada 2003). A problem for setting baselines is that no universal classification by types of activities exists, which makes any comparison extremely difficult (Perez-Lombard et al. 2008). Comparing data from the US, Spain and the UK, Perez-Lombard et al. (2008) find that office and retail buildings are the most energy-intensive buildings among non-residential ones, followed by hotels and restaurants, hospitals and schools. Air conditioning is the main energy consumer, followed by lighting and appliances. Agreeing with the Canadian study, they also find that building type is a critical factor determining energy intensity and how energy use is distributed. A potential classification of building types may be based on the one used by the approved CDM methodology for whole-building efficiency projects (AM 0091)[36], which provides a list of building types based on information from several building codes and building efficiency programmes worldwide (for the background of the methodological approach see Hayashi et al. 2010).

Beyond the purpose of the buildings, many other factors influence their emissions levels. Natural Resources Canada (2003) finds that energy intensity also varies regionally, by year of construction, building size, and type of owner. UNEP (2007) in addition emphasizes the role of climate differences and of income levels for both energy intensity and distribution across different uses and/or energy carriers. With respect to climate, the number of heating and cooling degree days can be useful in estimating how much energy is needed for different uses such as heating, air conditioning, refrigerators and other appliances. In terms of income levels, a clear transition can be observed from, for example, the high use of biomass for cooking and heating in poor households, to the use of other fuels and finally to electricity as income rises. In addition, the preferences and culture of the users also influence energy use, as do the design and orientation of buildings.

Hence, buildings emissions are generated by different fuel types and uses, which in turn depend on the factors mentioned above: building types, climate zones and level of economic development. According to UNEP (2007) in rural areas of Sub-Saharan Africa between 90 and 100% of household energy consumption is used for cooking. In developed countries, on average, most residential energy is used for space heating, and then for water heating and domestic appliances. The main emission sources can be classified into electricity use (indirect emissions), use of fossil fuels (e.g. for heating or cooking), external supply of chilled or hot water (indirect emissions), refrigerant leakage, and use of unsustainable biomass (for cooking).

While these different fuel types and uses can be regarded independently from each other to establish emission baselines, it is also known that they interact with each other. For example, savings in lighting can lead to reductions in energy use for ventilation and cooling, due to the reduced heat produced by the lighting equipment. It has been estimated that for every three

[36] http://cdm.unfccc.int/UserManagement/FileStorage/8RIP2VC674KZTUJEDLAWQXBNYFM3OG

watts of lighting energy reduction about one watt of air-cooling energy can be saved (UNEP 2007).

5.5.2 Considerations for setting baselines

Baselines for the buildings sector need to deal with all the elements discussed above within their level of aggregation:

- Process: Depending on the data availability, baselines can be established on the basis of a whole building approach (e.g. with indicators such as energy consumption or emissions per square meter of building area) or can be differentiated across individual uses (heating, cooling, lighting, cooking, other appliances, etc.).
- Product: Baselines need to be differentiated between commercial and residential buildings, and within these categories between different sub-types of buildings. The size of the building may also have an effect on energy efficiency and emissions.
- Time: Baselines can consider the different technological standards existing in new versus existing buildings.
- Space: Baselines need to be set up for buildings within regions with similar climatic and socio-economic conditions. Differences may exist between urban and rural areas, and in large countries between different regions.

Beyond the complexity of the buildings sector, the lack of sufficient and consistent information is also a barrier for setting baselines (Perez-Lombard et al. 2008). Developed countries nowadays regularly perform comprehensive surveys on the energy consumption of residential and commercial buildings, e.g. by Natural Resources Canada or by the Energy Information Agency in the US. Such studies can be a useful reference for developing countries wishing to start tackling energy efficiency and emissions in this sector.

Opportunities to tackle emissions in the buildings sector hence range from energy efficiency measures (for heating through insulation and multi-glazed windows, for air conditioners and electric appliances, and for lighting), to fuel switch (e.g. in heating systems), use of renewable energy (centralized or decentralized at the building level), replacement of refrigerants and behavioural changes. How many of these opportunities can be grasped by a baseline depends, as in the case of power and cement, on its scope. A whole-building approach (e.g. as used in the CDM Methodology AM 0091) can be used to tackle as many emission reduction measures as possible per building unit. Such an approach allows estimation of an indexed emissions baseline in terms of tCO_2e per m^2 of residential building area, and accounting for synergies across different energy uses as described above. Its drawback is, however, the extensive data requirements. Data on energy consumption and refrigerant leakage need to be available per building unit, data on floor area and socio-economic status of occupants (income level or property price) can be collected for a representative sample (Castro et al. 2011). Wehner et al. (2010) use a simplification of the whole building approach, differentiated according to climatic zone in calculating a baseline for the Mexican residential sector.

Another approach to tackle emissions in the buildings sector could be to focus at individual measures, as has been done so far in the CDM. At a sectoral level, the task could be simplified if monitoring would be done at the supply side. For example, for energy efficient appliances, baselines could be set on the basis of how many refrigerators with a certain energy efficiency level are sold in the country. In this way, the rate of penetration of specific technologies could be used as a baseline metric. Measures such as labelling and setting energy efficiency standards could then be introduced and their impact could be measured by looking at the change in purchase patterns ex post. The actual emission reductions could be estimated by surveying a sample of users in terms of hours and patterns of use, lifetime of equipment, etc. and by taking into account the relevant grid emissions factor and typical energy consumption levels of the appliance.

A more complex but also comprehensive possibility is the modelling approach adopted by McNeil et al (2008) in their study of energy efficiency potentials in the buildings sector. On the basis of global macro-regions and macroeconomic data and projections (income levels, percentage of urbanization, percentage of electrification), this study forecasts how major appliances will diffuse in the residential sector, how floor space of commercial buildings will grow and how different equipment will penetrate the sector per region up to 2030. The model is based on the notion that the level of energy services demanded by households and businesses depends on economic growth. As growth projections are uncertain, this is the component of the model that is most uncertain, too. The growth projections are used to forecast levels of activity for the different components analysed on the basis of econometric techniques: diffusion of certain type of appliances in households (i.e. how many of these appliances are used per household), and floor space of commercial buildings. To estimate energy consumption, the model relies on estimations of the typical annual energy consumption of appliances in each region, which depend on what types of appliances are used (e.g. what size of refrigerator), the average energy efficiency of the appliances used, and on use patterns (driven by climate – heating and cooling degree days). Finally, the model can also estimate energy saving potentials by modelling scenarios of future diffusion of efficient appliances. Such an approach would allow generating baselines in terms of energy consumption per type of appliance per household.

As in other sectors, baselines for the building sector would ideally need to take into account the existence of policies that already affect emission levels. This is, for example, carried out by Wehner et al. (2010) in their baseline for a NAMA in the Mexican residential building sector. Even though developing countries frequently have enacted policies to regulate energy consumption in buildings (building codes, but also economic incentives such as tax rebates and financial support for retrofitting measures), enforcement and compliance are often insufficient. The lack of financial and human resources leads to weak monitoring mechanisms. Price distorting subsidies for energy prevent changes in energy consumption patterns. Information barriers and lack of capital prevent investments in energy efficiency. Richerzhagen et al. (2008), for example, provide a detailed account of the challenges in China to enforce the energy efficiency policies supported at high political levels. Hence, not only the existence but also the real application of such policies needs to be taken into account in baselines.

5.6 Qualitative discussion of illustrative baselines

In order to evaluate the suitability of the proposed options for setting the baseline and potential sectoral targets outlined in chapters 4, 5 and 6, the different approaches should be evaluated against the different design elements and corresponding evaluation criteria described in chapters 2 and 3.

With regard to the baseline ***scope***, all power plants in the electricity system (or in a specific grid like the NEWNE grids or Southern Grid) or all cement plants in a country should ideally be included in the sector. However, in practice, databases usually cover only a part of all installations in the system. In the power plants database used for this analysis, captive power plants that cover 10% of electricity production are not included, nor are certain renewables and small units (section 5.3.2). In the cement case study, only 50% of the sector is covered by the CSI database, and notably small and inefficient plants are not included. In addition, the coverage of the database has changed over time (section 5.4.2). For the purpose of baseline setting and subsequent monitoring, it should be ensured that the coverage is consistent throughout the time series. For instance, if the coverage of power plant operators varies over time or if the cut-off criteria for inclusion of power plants is modified (e.g. 5 MW in one year and 20 MW in another year), artefacts of emission reductions or increases may occur which do not reflect the real development. This effect may jeopardise the environmental integrity of the system.

In this report, we have started from the idea that the NMBM will be based on specific economic sectors, such as electricity or cement. But the UNFCCC definition refers to "broad segments of the economy", which could well mean a segment that includes several (unrelated) economic sectors, e.g. electricity and heavy industry. In this case, individual baselines should be established for each of the economic sectors included (electricity, cement, steel, etc.) while they can then be aggregated to one overall baseline. Basing the emissions threshold (or target) on this overall baseline is advisable because it allows for flexibility (and cost reduction) in terms of how to reach the emissions goal. But by first establishing individual baselines for each of the sectors more transparency about real trends in emissions and hence about the environmental implications of the baseline (and the threshold or target) can be achieved.

The ***product*** to be evaluated can be homogeneous or not within a sector. In the power sector, due to the homogeneity of electricity, there is no issue of definition. However, in some cases, power plants may co-produce heat (combined heat and power (CHP) plants) which may be used to reduce fuel consumption in other sectors (reducing fuel consumption of boilers). In this case, the product heat should be considered, too, and the scope of the analysis may need to cover final consumption sectors, too. However, this is methodologically challenging which is demonstrated by several studies on the evaluation of CHP. In the case of cement, baselines can be based on clinker or on cement production, and could be further disaggregated if different types of cement have different properties affecting its final use.

For the buildings case, we have seen that baseline scope will need to be more narrowly defined than at the whole sector level. Sub-sectoral approaches will be more able to reflect the differences in energy service consumption between urban and rural areas, residential and commercial buildings, and regions with different climates. In addition, separate baselines can be established for different appliances or other equipment or uses, or a whole building approach can be used.

With regard to further differentiation, the dataset should include information on vintages, capacities, fuel types, other raw materials, technology and energy efficiencies at the most disaggregated level possible. This allows a more sophisticated evaluation of power and industrial sectors over time. Aggregated data (e.g. as mentioned above, specific CO_2 emissions are not available for individual power plants, but only for the power plant as a whole) may reduce significantly the validity of the calculated baseline.

With regard to the ***reference data*** used, several lessons can be learned. Firstly, the analysis shows that different approaches of using reference data for establishing the baseline show similar results, within ranges of uncertainty, if projections of activity levels are left constant. However, sectoral targets are very much dependent on the type of data and assumptions used for the calculation. In addition, if potential variation in projected activity levels is incorporated into the baseline (as we did in the case of absolute emissions from the cement sector, see Figure 18), very high uncertainty is the result. Thus, if a high emissions projection is chosen, the credited reductions may not be "real". Furthermore, some of the projections, even if they have a very good statistical fit, may not be realistic, as in the case of projected Indian cement production levels up to 2030. One way to deal with such uncertainty is to be transparent about the assumptions of the projections and the methods used, and to show different projections, as we have done above, so that a conservative estimate of future emissions can be chosen among the several projections. It is also important to be clear about the implications of the projections, e.g. in terms of projected per capita demand or needs of blending materials, or expected gains in energy efficiency (are they realistic?). An approach to take this into account is to incorporate caps in the projections, as is the case for the power case study. In order to reduce uncertainty of projections, frequent updates of the activity levels underpinning the baseline could also be considered.

Secondly, the projections that we have estimated are based merely on historic data on production levels, emission levels, and some drivers of emissions (in the case of cement, fuel mix, fuel consumption and clinker to cement ratio), and on some future projections of other drivers (GDP and population). No consideration of the effect of past policies or of technological costs and financial viability of the projected emissions paths has been included in the estimations. This means that the idea of financial (or policy) additionality, very important in the CDM context, has been left out of our consideration of baselines for the NMBM.

Thirdly, our projections are based on a limited dataset (the Central Electricity Authority includes 5 years, the CSI database 8 years). This, of course, leads to substantial uncertainty in projections for much longer timescales. It also makes it statistically difficult to include many emission drivers as predictors for future emissions. Having longer historic time series would hence be very helpful for improving the reliability of future projections, and in recognising potential changes in observed trends and their causes. Nevertheless, if sufficient reliable data is not available, it can also be gathered in a pre-implementation phase. In this regard the situation of many developing countries is not that much different to the situation of many developed countries before they started to implement market-based GHG mitigation policies. Availability of reliable data may be a difficulty in the domestic implementation of the NMBM but should not prevent any such implementation. If required, implementing countries would need to establish a data gathering and compilation phase before the proposal for the implementation of the NMBM can be submitted.

Fourthly, the inclusion of the appropriate emission drivers in the projections is important, also in relation to the scope of the baseline. As we have seen for the case of cement, for a baseline that is indexed on clinker production, mainly the energy consumption and fuel type determine emission levels in our case study. For a baseline indexed on cement production, the blending percentage comes in addition (and also indirect, electricity-related emissions, but this data was not available). In other countries with a more diverse industry, other factors may need to be taken into account such as type of technology. For cement, emission levels are very different between the dry and the wet process, and between different kiln designs and sizes. In India, however, at least among the plants covered by the CSI, only the dry process is used. The many small plants that very likely have higher emission levels are outside of the scope of the baselines that we have estimated, as they are not covered by the CSI data. In a real-world situation they would need to be included. In all cases, a balance needs to be found between inclusion of potential emission drivers in the modelled scenarios and transparency of the assumptions and projections. The more drivers are included, the more data needs to be projected into the future and the more assumptions need to be made for calculating these projections. This may leave room for manipulating assumptions to reach more favourable baselines. Again, being transparent about assumptions and displaying several projections with different assumptions is necessary to demonstrate the reliability of a baseline. One option would be to agree ex-ante on certain standard parameters to be used in projections, e.g. future demographic and economic growth or the type of sensitivity analysis that should be conducted.

In terms of ***dynamics and updating***, the baselines we have illustrated have relied exclusively on historic data or projections based on historic data. As discussed above in the literature review, the reliability of the baseline can be improved substantially if it is related to parameters that are monitored in real time, or if it is updated periodically on the basis of such monitored parameters. For example, an indexed baseline could be set on the basis of historic trends in energy efficiency improvements, but on a yearly measured fuel mix and blending percentage. The difficulty in this case would be to disentangle the effect of changes that are taking place because of BAU developments, and changes that are a result of policies oriented to reducing GHGs. In the case of the Indian power sector, the analysis showed that estimated specific CO_2 emissions of some power plant types are expected to increase. Technologically this is unlikely to be persistent; it could be linked to start-up problems of new plants, as well as incentives to over-report fuel use. In the longer term, the autonomous improvement of power plants should prevail, which leads to decreasing specific CO_2 emissions over time. Therefore updating of data for baseline setting may be required. Alternatively, this could be addressed by setting a stringent sectoral target, which outweighs the uncertainty related to baseline setting.

Concerning ***metrics***, the environmental effectiveness of baseline options and sectoral targets depends on the methodology and assumptions. Absolute baselines may be increasing (as in this analysis) or decreasing. Similarly, (politically negotiated) absolute sectoral targets may be more or less ambitious. The advantage of using absolute values is that all kinds of measures can be considered at the same time: efficiency improvements, fuel switch and demand reduction. Indexed baselines or sectoral targets do not necessary lead to decreasing overall emissions, especially if specific emissions are expected to increase. In the case of applying benchmark values for individual power plants, overall emissions also may increase due to the overall increasing trend of electricity generation or cement production. Overall emission reductions are then only achievable if there is a dedicated sectoral target leading for a far-reaching decarbonisation of the sector, either by (politically) specifying decreasing specific CO_2 emissions or an increase of emission-free fuels in the overall fuel mix. In addition, a target in terms of energy consumption per unit of GDP can act in combination with the sectoral indexed baseline (and target or threshold) to address the demand side.

5.7 Conclusions and recommendations for baselines of a sectoral NMBM

The case studies of sectoral baselines in the power, cement and buildings sectors provide several lessons that need to be considered when discussing baseline setting and the modalities and procedures for a NMBM.

In its conception, a sectoral-level NMBM is more similar to international emissions trading than to the CDM, and the development of baseline-setting methodologies for the NMBM needs to take this into account. Sectoral baselines need to include all emissions of existing and projected new installations of the covered sector(s); ideally, they need to take into account the drivers of emissions in order to generate realistic projections about how the sector will develop into the future. Developments at the sector level include not only adding new, state-of-the-art installations, but also retrofitting or decommissioning old ones. This kind of logic is very different to the CDM-like approach of determining what investors of individual new installations would most likely do in the absence of the CDM. It is more similar to emissions trading – where baseline setting has been difficult, politically contested and too lenient in most cases, or to the projections of future emissions included in national communications. This sectoral logic for baseline determination has important implications in terms of the data requirements and assumptions for projecting future trends.

In terms of **data quality,** the coverage of the data needs to be as comprehensive as possible, so that possibly a whole sector can be considered in the baseline. The coverage needs to remain consistent over time to avoid potential biases in the future emission projections. In sectors as complex as the buildings sector, where data collection at the building level is very costly, a NMBM could be started at the sub-sectoral level, e.g. by focusing on specific types of appliances and by monitoring their consumption at the supply side (e.g. retailers). Ideally, GHG emissions data is needed, but if it is not available, activity data or penetration rates of a technology and an emissions factor can also be used. Data should also be available on vintages, capacities, fuel types, other raw materials and energy efficiencies at the most disaggregated level as possible, to allow for a more sophisticated evaluation of the drivers of emissions over time. Aggregated data may be used for setting sectoral baselines, but may reduce its validity if the sector is heterogeneous. The longer the time series of available historical data, the more accurate the projections will be, and the more emission drivers may be considered for setting the baseline. However, if appropriate data is initially not available, it may be gathered in a pre-implementation phase. Moreover, a tiered approach may be considered where uncertainty discounts are relaxed as soon as more reliable data becomes available.

In heterogeneous sectors with many products or technology types (and vintages), or in broad segments that include several economic sectors, it is advisable to establish a baseline for each of the products or sectors, and then aggregate it into an overall baseline. This ensures that the baselines are reliable and conservative by promoting transparency into the data and assumptions, but it also provides flexibility in how to reach the envisaged emission reductions.

Another important lesson for ensuring the environmental integrity of sectoral baselines and targets is the **transparency of assumptions**. As shown above, many different approaches may be used to project expected emission levels into the future, from simple linear projections of historical emissions levels, to regressions on the basis of drivers of emissions, to more complex models of a whole economy. While, ideally, information on all potential drivers of emissions can thus be used for setting the baseline, this should be weighed against the cost of collecting all these data and the simplicity and transparency of the baseline. Different types of projections may yield similar results (within levels of uncertainty), especially if projected activity levels are left constant. However, if absolute baselines are used, potential variation in projected activity levels is incorporated into the baseline, so that very high uncertainty may result. Thus, transparency about the assumptions of the projections and the methods used is necessary, and if possible, different projections (e.g. by relying on different projection methodologies as done above, or by slightly varying some of the critical assumptions) should be shown so that the sensitivity of the baseline to these assumptions can be assessed. Then, a conservative estimate of future emission levels can be chosen among the several projections.

A decision needs to be taken at UNFCCC level about whether it is advisable to let developers of baselines choose what types of projections and assumptions they use (provided these are communicated clearly and can be replicated) or whether it is necessary to develop ex-ante guidelines and agreements about the methods (e.g. extrapolations, regressions, modelling, sensitivity analysis), the metrics (absolute, indexed baselines, or baselines based on technology penetration rates) and specific parameters (e.g. IPCC default emission factors, a centralised source of future demographic and economic growth) to be used for the projections.

Important is also to make sure that the projections are **realistic** in terms of what is achievable with the existing technology, but that they keep the incentive towards reducing emissions. With a given technology, a declining trend in relative emission levels may not be possible to continue ad infinitum because the efficiency limit of the technology will be reached at some point. This may need to be taken into account in the projections, e.g. by incorporating caps. At the same time, however, an incentive to invest in research and development of zero-emission technologies needs to be maintained because for a transition to a carbon free economy all emission rates will eventually need to reach zero. In addition, if the existing (historical) data shows unrealistic patterns (e.g. as seen above, increasing specific CO_2 emissions of power plants over time), this may point towards unreliable data, or towards missing emission drivers that still need to be taken into account. In principle, having an indexed baseline (a projection of specific emissions per unit of output) that increases over time should not be allowed as it goes against the goal of reducing emissions and against the expectations that technologies improve over time. To keep long-term incentives for technological change and to provide investment certainty, baselines should be valid as long as possible, but this increases uncertainty regarding the realism of the baseline. A realistic baseline would require frequent updates (e.g. every 5 years); updates should only be allowed when they lead to strengthening the baseline, not to relaxing it.

Overall, determining baselines for a sectoral NMBM implies a different way of thinking that departs from the CDM; it requires better and broader data and agreement on guidance about critical assumptions and minimum transparency requirements. This will be challenging; however, the experience already gathered – from existing emissions trading schemes, from projections of future emissions in national communications, and from industry efforts to collect sectoral data – will make the determination of sectoral baselines possible.

5.8 References

Aasrud, A., R. Baron and J. Ellis (2010). "Scaled-up Market Mechanisms – What is Needed to Move Forward?". Greenhouse Gas Market Report 2010 - Post Copenhagen and Climate Policy: Where Global

Emissions Trading Goes from Here. A. Kramer. Geneva, International Emissions Trading Association: 115-118.

ACC Limited. (2012). "Key Performance Indicators." Retrieved 29 June 2012, from http://www.acclimited.com/newsite/finance.asp?tag=kpi.

Ambuja Cements Ltd. (2012). Annual Report 2011. Mumbai, Ambuja Cements Ltd. Retrieved 29 June 2012, from http://www.ambujacement.com/download.php?f=Annual%20Report%202011.pdf.

Bischoff, J. (2008). Potential of the use of biomass and waste in cement production. Stakeholder Discussion Forum: Building a Sustainable Cement Sector in India, New Delhi, India, TERI Business Council for Sustainable Development, 18-20 September 2008.

Broekhoff, D. (2007). Expanding Global Emissions Trading: Prospects for Standardized Carbon Offset Crediting. Report prepared for the International Emissions Trading Association. Washington, D.C., World Resources Institute.

Cai, W. J., C. Wang, J. N. Chen, K. Wang, Y. Zhang and X. D. Lu (2008). "Comparison of CO2 emission scenarios and mitigation opportunities in China's five sectors in 2020." Energy Policy 36(3): 1181-1194.

Castro, P., D. Hayashi, M. Stadelmann, A. Michaelowa, M. Cames and S. Healy (2011). Solving the MRV Challenge for New Market-based Mechanisms: What can Past Experience Teach us? Discussion Paper. Berlin, Hamburg, Zurich, Öko-Institut, Perspectives and University of Zurich.

Central Electricity Authority. (2012a). "Baseline carbon dioxide emissions from power sector." Retrieved 24 April 2012, from http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm.

Central Electricity Authority. (2012b). "National Electricity Plan. Volume 1: Generation." Retrieved 11 August 2012, from http://www.cea.nic.in/reports/powersystems/nep2012/generation_12.pdf.

CMA (2010). Annual Report 2009-10. New Delhi, Cement Manufacturers' Association. Retrieved 28 June 2012, from http://www.cmaindia.org/portal/static/AnnualReport2009-10.pdf.

CMA. (2012). "Highlights of Indian Cement Industry as of 31st March, 2011." Retrieved 29 June 2012, from http://www.cmaindia.org/portal/industry/highlights.aspx.

CSI. (2012). "Global cement database on CO2 and energy information." Retrieved 22 April 2012, from http://wbcsdcement.org/GNR-2010/index.html.

EIA. (2011). "International Energy Outlook 2011." Retrieved 25 June 2012, from http://205.254.135.7/forecasts/ieo/.

Ghosh, J. and C. P. Chandrasekhar (2009). "The costs of 'coupling': the global crisis and the Indian economy." Cambridge Journal of Economics 33(4): 725-739.

Government of India. (2010). "Submission related to the Copenhagen Accord." from http://unfccc.int/meetings/cop_15/copenhagen_accord/items/5265.php.

Graus, W., E. Blomen and E. Worrell (2011). "Global energy efficiency improvement in the long term: a demand- and supply-side perspective." Energy Efficiency 4(3): 435-463.

Hayashi, D., N. Müller, S. Feige and A. Michaelowa (2010). Towards a more standardised approach to baselines and additionality under the CDM. Report for the UK Department for International Development. Zurich, Perspectives Climate Change.

IEA. (2008). "IEA GHG CO2 emissions database." from http://www.ieaghg.org/index.php?/20091223127/co2-emissions-database.html.

IEA (2011). World Energy Outlook 2011. Paris, OECD/IEA.

IEA (2012). World Energy Outlook 2012. Paris, OECD/IEA.

Indian Brand Equity Foundation (2011). Cement - November 2011. Haryana, India, Indian Brand Equity Foundation. Retrieved 24 June 2012, from http://www.ibef.org/download/Cement50112.pdf.

IPCC (2006). 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Hayama, Japan, IGES.

Kumar, K. (2008). Latest technological trends in the Indian cement industry. Stakeholder Discussion Forum: Building a Sustainable Cement Sector in India, New Delhi, India, TERI Business Council for Sustainable Development, 18-20 September 2008.

Lazarus, M., S. Kartha and S. Bernow (2000). Key Issues in Benchmark Baselines for the CDM: Aggregation, Stringency, Cohorts, and Updating. Report for U.S. EPA, Contract No. 68-W6-0055. Boston, Tellus Institute and Stockholm Environment Institute.

Lazarus, M., S. Kartha, M. Ruth, S. Bernow and C. Dunmire (1999). Evaluation of Benchmarking as an Approach for Establishing Clean Development Mechanism Baselines. Report prepared for US EPA, Contract No. 68-W6-0055. Boston, Tellus Institute, Stockholm Environment Institute and Stratus Consulting.

Lee, C., C. Chandler, M. Lazarus, S. Feige, N. Müller, P. Castro and D. Hayashi (2011). Opportunities for Standardization of Cement and Manure Management CDM Methodologies. Draft Report to US EPA. Washington, D.C., Hamburg and Zurich, Stockholm Environment Institute, Perspectives Climate Change and University of Zurich.

Levine, M., D. Ürge-Vorsatz, K. Blok, L. Geng, D. Harvey, S. Lang, G. Levermore, A. Mongameli Mehlwana, S. Mirasgedis, A. Novikova, J. Rilling and H. Yoshino (2007). "Residential and commercial buildings". Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. B. Metz, O. R. Davidson, P. R. Bosch, R. Dave and L. A. Meyer. Cambridge and New York, Cambridge University Press: 387-446.

McNeil, M. A., V. E. Letschert and S. de la Rue du Can (2008). Global potential of energy efficiency standards and labeling programs. Berkeley, CA, Lawrence Berkeley National Laboratory.

Michaelowa, A. (1998). "Joint Implementation - the baseline issue: Economic and political aspects." Global Environmental Change 8(1): 81-92.

Ministry of Environment and Forests (2010). India: Greenhouse Gas Emissions 2007. New Delhi, Ministry of Environment and Forests, Government of India. Retrieved 25 June 2012, from http://moef.nic.in/downloads/public-information/Report_INCCA.pdf.

Müller, N. and J. Harnisch (2008). A blueprint for a climate friendly cement industry. Report for the WWF – Lafarge Conservation Partnership. Gland, Switzerland, WWF.

Murtishaw, S., J. Sathaye and M. LeFranc (2006). "Spatial boundaries and temporal periods for setting greenhouse gas performance standards." Energy Policy 34(12): 1378-1388.

Nag, T. (2010). Captive Generation in India. The Dilemma of Dualism, in: IDFC (ed.) India Infrastructure Report 2010, New Delhi, p. 198-207

Natural Resources Canada (2003). Commercial and institutional building energy use - Survey 2000 - Summary report. Ottawa, Natural Resources Canada.

Pahuja, A. (2008). Established Technologies and Energy Management: The path towards GHG Mitigation in India. Stakeholder Discussion Forum: Building a Sustainable Cement Sector in India, New Delhi, India, TERI Business Council for Sustainable Development, 18-20 September 2008.

Parliament of India (2011). Ninety fifth report on performance of cement industry. New Delhi, Parliament of India, Department related Parliamentary Standing Committee on Commerce. Retrieved 29 June 2012, from http://dipp.nic.in/English/Performance_Cement_Industry.pdf.

Perez-Lombard, L., J. Ortiz and C. Pout (2008). "A review on buildings energy consumption information." Energy and Buildings 40(3): 394-398.

Prag, A. and G. Briner (2012). Crossing the Threshold: Ambitious Baselines for the UNFCCC New Market Mechanism - Draft Discussion Document. Climate Change Expert Group (CCXG) Global Forum on the New UNFCCC Market Mechanism and Tracking Climate Finance, Paris, OECD/IEA, 19-20 March 2012.

Prag, A. and C. Clapp (2011). Setting National and Sectoral Baselines - Draft Discussion Document. CCXG/Global Forum on Environment Seminar on MRV and Carbon Markets, Paris, OECD/IEA, 28-29 March 2011.

Prag, A., J. Ellis and A. Bilski (2011). Setting Emissions Baselines: Choosing Metrics for National and Sectoral Baselines - Draft Discussion Document. CCXG/Global Forum on Environment Seminar on MRV and Carbon Markets, Paris, OECD/IEA, 19-20 September 2011.

Probase (2002). Procedures for Accounting and Baselines for JI and CDM Projects, Final Report, Groningen

Rajasekar, L. (2008). Responsible use of fuels & raw materials - Indian cement industry. Stakeholder Discussion Forum: Building a Sustainable Cement Sector in India, New Delhi, India, TERI Business Council for Sustainable Development, 18-20 September 2008.

Reserve Bank of India. (2011). "Handbook of Statistics on Indian Economy 2010-11." Retrieved 5 April 2012, from http://www.rbi.org.in/scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy.

Richerzhagen, C., T. von Frieling, N. Hansen, A. Minnaert, N. Netzer and J. Rußbild (2008). Energy efficiency in buildings in China - Policies, barriers and opportunities. Bonn, Deutsches Institut für Entwicklungspolitik.

Ruth, M., E. Worrell and L. Price (2000). Evaluating Clean Development Mechanism Projects in the Cement Industry Using a Process-Step Benchmarking Approach. Berkeley, CA, Ernest Orlando Lawrence Berke-ley National Laboratory.

Schneider, L. and M. Cames (2009). A framework for a sectoral crediting mechanism in a post-2012 climate regime. Report for the Global Wind Energy Council. Berlin, Öko-Institut.

Tam, C. (2008). Energy technology perspectives 2008 - Cement. Stakeholder Discussion Forum: Building a Sustainable Cement Sector in India, New Delhi, India, TERI Business Council for Sustainable Development, 18-20 September 2008.

UNEP (2007). Buildings and climate change - Status, challenges and opportunities. Paris, UNEP.

US Geological Survey. (2012). "Mineral Commodity Summaries." Retrieved 6 June 2012, from http://minerals.usgs.gov/minerals/pubs/mcs/.

WBCSD and IEA (2009). Cement Technology Roadmap 2009 - Carbon emissions reductions up to 2050. Geneva and Paris, World Business Council for Sustainable Development and OECD/IEA.

Wehner, S., Krey, M., Gusmao, F., Hayashi, D., Michaelowa, A, Sam, N. (2010). Supported NAMA Design Concept for Energy-Efficiency Measures in the Mexican Residential Building Sector, Hamburg/Oslo

World Bank (2012). World Development Indicators, World Bank.

Worrell, E. and C. Galitsky (2004). Energy Efficiency Improvement Opportunities for Cement Making - An ENERGY STAR Guide for Energy and Plant Managers. Berkeley, CA, Ernest Orlando Lawrence Berkeley National Laboratory.

6 Institutional design

Work package 5, by Martin Cames (Öko-Institut), 20 September 2011

The presentation below was held by Martin Cames at the OECD climate change expert group (CCXG) meeting in September 2011 in Paris, France. This presentation embodies, together with further deliberations on the institutional design of the NMM, which were directly included into the draft of the EU submission as of 5 March 2012 (http://unfccc.int/resource/docs/2012/awglca15/eng/misc06.pdf, pp. 7-16), the result of work package 5.

A key issue in the design of the NMM is whether it would be coordinated internationally ex ante or whether parties would establish their own schemes and try then ex post to link these schemes in order to enhance the coverage of the carbon market and thus increase efficiency. Basically both approaches would be feasible. However, the first approach may postpone an agreement since negotiations may need longer discussions before an agreement among all parties could be agreed. The latter approach may seem to be quicker since parties could build up their own market-based scheme right away. Nevertheless, linking with other market-based schemes may take even longer or may not be possible at all since their designs may be too diverse.

Two further disadvantages of the uncoordinated approach are:

- If there is no common international standard on the environmental stringency and the level of ambition, each party which intends to link its market-based scheme with another party's market-based approach has to scrutinise whether the other party's scheme is comparable in its design and does not undermine the Party's own scheme. As long as there are only a few parties who want to link there scheme, this may be straight forward. However, if a tens country wants to link with 9 others, then it's scheme would have to be scrutinised by 9 other countries while the 10th country would have to scrutinise 9 other market-based schemes – unless countries who have linked there scheme do not actually start to coordinate internationally.
- If two countries are already linked and are approached by a third country and it would turn out that one country would assess the third countries scheme as too week and not linkable with its own scheme than this country would need to insist that the other country does not link with the third country either. Otherwise the rejection of the first country would by undermined by the acceptance of the second already linked party. Extending the coverage or linked countries would thus always require the agreement of already linked countries. Extending the coverage would need to follow accession rules as they are applied in the WTO or in the EU. Experience shows that this is a time consuming process.

In addition to these disadvantages of it has to be taken into account that schemes which comply with significant different standards in terms of environmental integrity need to be kept separate and cannot be linked. Otherwise the scheme with the lowest standard would trigger a race to the bottom and thus finally establish the standard for the entire scheme. Keeping market-based scheme separate would, however, result in lower economic efficiency and would thus certainly not be an optimal solution.

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GHG unit accounting after 2012
Comments

CCXG Seminar on MRV and Carbon Markets
Paris, 20 September 2011

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Aims of international carbon markets

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- **Environmental goal**
  - GHG reduction
- **Economic efficiency**
  - Cost reduction
  - Large coverage
- **Environmental integrity**
  - Trust: 1t = 1t
  - Additionality: contribution to global GHG reduction
- **Transaction costs**
  - Fragmented markets: limited efficiency gains
  - Fungible units: international coordination

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International coordination

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- **Central ⇔ decentral?**

- **Direct ⇔ indirect**
- **Explicit ⇔ implicit**

- **Implicit coordination**
  - Seems to cause less red tape
  - Causes concerns that something should be hided,
    i.e. weaker environmental integrity
  - May cause a race to the bottom
    in terms of environmental integrity
  - May increase effective transaction costs since every country would have to assess the environmental integrity of every participating mechanism

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Gradual linking

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- **Without sufficient international rules which ensure environmental integrity countries would have to assess the integrity of other countries mechanism before recognising its units**
- **To ensure environmental integrity, countries would need to agree to recognise further countries only at mutual consent**
  - Country A and B agreed to recognise units
  - Country A may recognise units of country
    only if country B agrees
  - Country C may recognise units of country D
    only if countries A & B agree
  - etc.
  - Similar to other international accession rules (WTO, EU, etc.)
- **May result in fragmented markets, i.e. units with different qualities which may not be fungible**
- **Gradual reduction of fragmentation would take time**

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Key differences

	CRD.A: UNFCCC regulation of new mechanisms	CRD.B: Minimum standards and eligibility criteria	CRD.C: Transparency approach
Regulation	General M&P	Minimum requirements	Principles only
Level of ambition	Agreed at UNFCCC	Discretion of country	Discredtion of country
Scrutiny	UNFCCC accredited: approval	UNFCCC accredited: reporting	ISO Standards: reporting
Environmental integrity	Ensured	Limited	Limited
Fungibility	Homogenious marktes	Fragmented marktes	Fragmented marktes

Comments & questions

- **CRD.C Pros**
  - Developing new mechanisms leading to innovation:
    - Which innovation is envisaged (examples)?
    - Which of those could not be implemented under an UNFCCC approach?
  - Speed up transactions, facilitating a scaling up of carbon markets: national or international transactions/carbon markets?
- **CRD.A Cons**
  - Bottlenecks as with existing mechanisms: addressing broad segments would
    - reduce the number of cases significantly and
    - diminish many critical issues (project boundaries, leakage, etc.)
  - Long time to agree on M&P: detailed rules individual segments could be developed in an iterative process (leaning by doing)

To sum it up

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- Experiences from exiting UNFCCCC mechanisms cannot be directly transferred to new market-based mechanisms
- Crunch issues
  - Determination of the level of ambition
  - Scrutiny of performance
- Countries may not wish external oversight
  - Implicit assessment cannot be avoided
  - Implicit assessment would be less transparent

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Thank you for your attention!

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7 Draft modalities and procedures for a new market-based mechanism under the UNFCCC

Work package 6, by Martin Cames (Öko-Institut), Pedro Martins Barata, 29 May 2012

Note: This paper was not published but only submitted to DG CLIMA, which focused in a similar research and consultancy project on legal aspects of the design of a new market-based mechanism. These legal aspects, below highlighted in blue, were not elaborated further in this paper. Together both documents were used as a basis for a submission of the European Union on draft modalities and procedures for the new market-based mechanism (http://unfccc.int/resource/docs/2012/awglca15/eng/misc06a06.pdf pp. 3-15).

7.1 Background, Purpose and Sources

7.1.1 Background of the Project

The purpose of this paper is to provide a strawman proposal that can act as a starting point for discussions at EU level on actual textual proposals to put forward in the run-up to COP18 in November in Doha, Qatar.

7.1.2 Sources for the current strawman on Modalities and Procedures

Modalities and Procedures as attached in the following sections have had as sources:

- the submission of the European Union and its Member States of March 2012 on the modalities and procedures for a new market mechanism under the Convention;
- Decision 3/CMP.1 (Modalities and procedures for a Clean Development Mechanism)
- Decision 1/CP.16 (the Cancun Agreements)
- Decision 2/CP.17 (Outcome of the Ad Hoc Group on Long Term Cooperative Action)
- Schneider and Cames 2009: A framework for a sectoral crediting mechanism in a post-2012 climate regime, particularly section 11 "Modalities & Procedures for implementing a SCM

7.2 "Strawman" for a Convention Market Mechanism Decision

Decision XXX/CP.18

Modalities and Procedures for a Convention Market Mechanism

The Conference of the Parties to the United Nations Framework Convention on Climate Change,

Recalling the ultimate objective and principles of the Convention

Recalling previous decisions from Cancun and Durban (Cancun Agreements and Durban Platform)

Recalling the outcome of Ad Hoc Working Group on Long Term Action under the Convention on the definition of new market mechanisms;

Recognizing the experience of many parties with the implementation of Kyoto Mechanisms, namely the Clean Development Mechanism, Joint Implementation and International Emission Trading;

Emphasizing the need for mitigation actions to take place under a rules-based system, with broad participation of all parties in mitigation efforts, and appropriate contribution to mitigation reflecting the capabilities of Parties,

Adopts the modalities and procedures for the Convention Market Mechanism (CMM) contained in the Annex below:

7.3 ANNEX

Part I: Definitions

A. Definitions

1. For the purposes of the present annex the following definitions shall apply:

   a. a "Convention Market Mechanism Unit" (CMU) is a unit issued pursuant to the modalities contained in this Annex, and is equal to one metric tonne of carbon dioxide equivalent, pursuant to decision x/CP.17.

   b. a "broad segment of the economy" includes all emissions of one or more sectors, categories or sub-categories pursuant to decision 18/CP.8 and decision 13/CP.9.

   c. an "implementation track" is one of the particular types of implementation of the Convention Market Mechanism. This decision defines two implementation tracks: crediting and trading.

   d. "crediting" is characterized by ex-post issuance of CMU in respect of emission reductions achieved in relation to an ex-ante determined crediting threshold for a covered sector, category or sub-category during a baseline period;

   e. "trading" is characterized by ex-ante issuance of CMU in respect of emissions allowed for a covered sector, category or sub-category during a baseline period;

   f. a "baseline scenario" describes the evolution of activities under a proposed scope for the Convention Market Mechanism and shall include all relevant information on emission drivers relevant for the proposed scope;

   g. a "baseline" is a representation of the projected emissions in a sector, category, sub-category or a broad segment of the economy;

   h. a "threshold" is a representation of the level of emissions that is targeted under the proposed implementation track. It shall take the form of a crediting threshold in a crediting implementation track and a trading cap in a trading implementation track;

   i. a "baseline period" is the period for which CMU can be issued under a particular implementation of the CMM and during which neither the baseline nor threshold are being revised or updated;

j. an "emission driver" is any factor that is foreseen to have a relevant impact on the evolution of emissions in a particular sector, category or sub-category of the economy;

Part II Institutions

B. The Implementation Committee (IC)

2. The Implementation Committee shall act as supervisor of the implementation of the Convention Market Mechanism. In particular, the Implementation Committee shall:
   a. notify to Parties that any outstanding question related to the Party's implementation proposal raised by the Independent Review Team have been clarified;
   b. notify to Parties that any outstanding question related to the Party's annual report raised by the Independent Review Team have been clarified ;
   c. develop generic guidance on determining baselines and thresholds;
   d. develop guidance on means of implementation.
3. The Implementation Committee shall be composed of technical experts with the required competence in analysis of environmental policy, economic modeling and greenhouse gas emission mitigation technologies. Members shall be selected by regional constituencies in accordance with the Terms of Reference for members of the Implementation Committee inscribed in Appendix IV.
4. The Implementation Committee shall be composed of two members nominated by Parties included in Annex I, three members nominated by Parties not included in Annex I, one member nominated by each of the regional groups, and one member representing the Alliance of Small Island States. Constituencies shall ensure that the nomination procedure is competitive, open and transparent. Calls for candidates shall be open six months before the start of the term.
5. Members shall serve a maximum of two terms of three years each.
6. Members of the Implementation Committee serve in their independent and personal capacity. Members shall be covered by privileges and immunities in accordance with the United Nations Convention on Privileges and Immunities of 1946. Provisions in the legal outcome of the Ad Hoc Group on the Durban Platform shall ensure that these privileges and immunities are awarded to members of the Implementation Committee.
7. Members shall ensure that no conflict of interest arises with respect to participation in the Implementation Committee. Where such a conflict of interest is deemed to potentially exist, by virtue of nationality, prior or existing financial relations, with any proponent or Party involved with a proposal before the Implementation Committee, the member shall recuse himself/herself from the discussion of such proposal and abstain from related decisions.

C. The Independent Review Teams (IRT)

- description of the role of the IRT (similar to the ERT for review of inventories)

- terms of reference (perhaps the mandate of the existing ERT can be enhanced, expanded to review proposals for implementation of NMM and sectoral inventories; i.e. no new/additional body)
- composition and selection process

  The IRT needs to be composed of a team of experts with relevant sector and/or regional expertise to carry out the review of the national implementation of the NMM. The experts should be selected by the IC or UNFCCC secretariat from an international roster of experts.
- privileges and immunities
- conflict of interest and code of conduct provisions

D. The National Implementation Authority (NIA)

- designated by UNFCCC Focal Point to the UNFCCC

Part III Modalities

E. Role of the existing institutions

8. The Conference of the Parties shall provide generic guidance to the Convention Market Mechanism and respond to any requests for specific guidance forwarded to it by the Implementation Committee.

9. Parties implementing the CMM domestically may authorize legal entities to participate in actions leading to transfer or acquisition of CMUs. Participation is subject to whatever guidance may be provided by the Implementing Committee of the Convention Market Mechanisms. A Party that authorizes legal entities to transfer or acquire CMUs shall remain responsible for any obligation inscribed in its implementation proposal and shall ensure that such participation is consistent with the present annex. Legal entities may only transfer and acquire CMUs if the authorizing Party is eligible to do so at that time.

10. The Compliance Committee
    - Compliance control
    - Enforcement/infringements

F. Scope of implementation proposal

11. The coverage of sources, activities and gases, and the proposed length of baseline period define the scope of any particular implementation of the Convention Market Mechanism.

12. (*Structure of proposals*) Proposals for implementation of the Convention Market Mechanism shall include the following elements:
    a. the proposed implementation boundary, including a clear definition of the broad segment of the economy and the regional coverage in accordance with articles 15 to 21 below;
    b. the chosen implementation track (crediting or trading) for each sector, category or sub-category covered under the proposal;

c. the proponent, if it is an entity other than the NIA;

d. the list of gases to be covered;

e. a proposed length of the baseline period;

f. a set of baseline scenarios for each sector, category or sub-category covered under the proposal;

g. a baseline for each sector, category or sub-category and one aggregated baseline for the broad segment of the economy;

h. a proposed threshold for each sector, category or sub-category and one aggregated threshold for the broad segment of the economy;

i. a monitoring plan including a detailed plan for the monitoring, reporting and review of emission and activity data throughout the baseline period in accordance with article 30 below;

j. an implementation plan including detailing policies and measures to achieve the threshold pursued under the proposal;

k. an estimate of the average annual emission reduction during the baseline period.

13. *(Principles for coverage)* Any specific implementation proposal must take into account the following generic principles of coverage for the Convention Market Mechanism:

a. (Objectiveness): the geographical extension of the proposed coverage must be clearly and unambiguously defined; as a default, the appropriate geographical extension shall be the national territory of the Party proposing to implement the Convention Market Mechanism. Derogations from this default may be considered by the Implementation Committee, if adequately substantiated. The Implementation Committee shall elaborate further on the allowed scope for derogation.

b. (Comprehensiveness (activities)): all covered activities/entities must be clearly defined and identified.

c. (Distortion across production in multi-product facilities): all installations that produce more than one product must have all their production covered under the implementation proposal.

d. (Comprehensiveness (gases)): all greenhouse gases and sources within the sector, category or sub-category must be accounted for.

e. (Avoidance of leakage): leakage is minimized.

f. (Data completeness and quality): only relevant data of high quality must be used in defining both baseline and implementation scenarios

14. (*Sectoral and sub-sectoral scope*) As a general rule, the scope of each implementation is aimed at universal coverage within a sector, category or sub-category, defined either through reference to sectoral scopes under the IPCC reporting guidelines or to international or national economic and statistical references.

15. (*Double counting provisions*) Double counting of emission reductions within implementation proposals of the Convention Market Mechanism shall be avoided. To that end, it

shall be ensured in the proposal that there is no overlap across allocation of emission allowances and emission reductions. In particular, emission reductions from a crediting implementation track that may directly or indirectly affect emissions in sectors, categories or sub-categories covered by a trading implementation track must be unequivocally attributed. In case of potential double attribution, the National Implementation Authority shall rule on the attribution of coverage, so as to avoid double counting of emission reductions.

16. *(Double counting with CDM)* Double counting of emission reductions issued as certified emission reductions to project activities registered under the Clean Development Mechanism shall be avoided. In line with paragraph 18, it is the responsibility of the National Implementation Authority to ensure that provisions are in place to avoid double counting of emission reductions certified under the Clean Development Mechanism of the Kyoto Protocol.

17. The baseline period shall not be shorter than three years. Every five years after the start of the baseline period, an Independent Review Team will conduct a review of the applicability of the threshold. If required in light of the review, the level of ambition in the threshold shall be increased; under no circumstances shall the level of ambition in the thresholds be decreased.

18. Baseline periods shall take into account the periods set out for any pledges by the relevant Parties under the Cancun Accords, and any commitments to be established under the legal outcome of the Ad Hoc Group on the Durban Platform.

G. Baseline scenarios and baselines

19. *(Principles of baseline setting)* The following principles for baseline scenarios shall be observed in any implementation proposal of the Convention Market Mechanism:

    a. Baseline scenarios shall take into account all relevant sources of greenhouse gas emissions within the proposed implementation boundary;

    b. Baseline scenarios shall deliver a conservative assessment of expected greenhouse gas trends over the baseline period, as well as conservative assessments of trends in emission drivers;

    c. Baseline scenarios shall take into account the technical lifetime of existing activities or installations, emission performance rates of best available technologies for new activities or installations and projected developments of demand for products or services;

    d. Baseline scenarios shall take into account existing and planned policies and measures;

    e. Baseline scenarios may be established in a differentiated way, if justified by the different nature of facilities or activities within the proposed scope of the implementation proposal. Acceptable criteria for differentiation include: vintage of installations or equipment, product or service differentiation within the proposed scope and differentiation of emission drivers across different activities within the proposed scope.

f. A methodology for developing a baseline scenario in a given activity type or source category shall be replicated, mutatis mutandis, for all further implementation proposals for similar activities.

g. Where activities or facilities under the proposed scope are covered by CDM project activities, the baseline scenario for the proposed implementation of the Convention Market Mechanism shall consider the development of these project activities.

20. The following principles shall guide the development of baselines under an implementation proposal:

a. (accuracy) The implementation proposal shall describe GHG emissions developments during the proposed baseline period as accurately as possible, by taking into account the development of all relevant emissions drivers;

b. (completeness) The implementation proposal shall include all relevant sources of GHG emissions;

c. (reliability) The implementation proposal shall be based on actual data of entities or installations covered by the scope of the proposal; where such data is not available or relevant, the proposal must ensure that the supporting data for the baseline is reliable;

d. (robustness) Baselines should be minimally sensitive to variation of the values of the most influencing parameters; sensitivity analysis shall be conducted on the more relevant emission drivers;

e. (materiality) Analysis of future emission trends may disregard variations in parameter values that contribute only negligible changes in the projection;

f. (conservativeness) In case of uncertainty over accuracy of parameters, those which result in lower baseline emission projections shall be selected;

g. (context) Baseline determination should include historical data prior to the baseline period.

21. *(Differentiation within scope)* Baselines may be established in a differentiated way within a given scope, if justified by the different nature of facilities or activities within the proposed scope of the implementation proposal. Acceptable criteria for differentiation include product or service differentiation within the proposed scope and differentiation of emission drivers across different activities within the proposed scope. In particular, where more than one activity or product is considered under the scope, different baselines may be developed for different activities. However, coherence across all baselines within the proposed implementation must be ensured.

22. *(Types of baselines)* For each sector, category or sub-category, proponents may choose from the following baseline approaches:

a. For the both implementation tracks, absolute emissions, in which baselines are established as absolute amounts of carbon dioxide equivalent emissions for the proposed scope.

b. For the crediting implementation track, indexed emissions, in which baselines are established as a function of one or more indexes.

c. For crediting implementation track, technology penetration rates, in which baselines emissions are established by function of the expected development of penetration of particular technologies covered in the scope.

H. Thresholds

23. Thresholds shall represent significant deviations from baseline emissions, specified as an agreed emission reduction compared to the baseline.

24. *(Approaches to thresholds)* The specification of the deviation level from baseline emissions expressed by the thresholds may be based on the following approaches, or a combination thereof:

a. A default thresholds should be [20]% below baseline emissions.

b. Mitigation potential and/or costs achievable in the absence of the Convention Market Mechanism;

c. Emission rates based on a reference technology: for sectors that encompass several competing technologies, the emission performance of a reference technology may be used;

d. Emission benchmark based on historical data: Thresholds may be set by reference to a particular emission benchmark derived from historical data in the activities considered in the scope of the implementation proposal;

e. Technology penetration scenario: thresholds may be set based on a defined technology penetration scenario that goes beyond the baseline scenario.

f. Policy objectives scenario: thresholds may be set by reference to stated objectives in the sector or country.

I. Monitoring and reporting

25. *(Monitoring principles)* Monitoring and reporting of emissions in the trading implementation track and of emission reductions in the crediting implementation track shall adhere to international standards. Proposals for implementation of the Convention Market Mechanism shall be guided by the following principles:

a. (Monitoring responsibility) Compliance with international standards for monitoring and reporting of emissions or emission reductions shall be assigned unequivocally to the National Implementation Authority, which shall ensure that national arrangements conform to such standards;

b. (Reporting responsibility and delegation) Likewise, responsibility for reporting, collecting, verifying and storing data in relation to any implementation proposal of the Convention Market Mechanism lies solely with the National Implementation Authority, unless notified otherwise to the Implementation Committee by the National Implementation Authority, in accordance with provisions under articles [y] to [x] (section G) above;

c. Proposed monitoring methodologies and monitoring reports shall be transparent, replicable and made publically available;

d. Data sources used in the baseline scenarios, the baselines or implementation calculations shall be public. Data used to substantiate either baseline or implementation calculations cannot be deemed confidential; however, aggregated data may be presented at the lowest level of aggregation deemed necessary to safeguard commercial confidentiality; where data sources are not available for key parameters used in baseline or implementation calculations, the most conservative default parameters shall be used;

e. All relevant data pertaining to baseline and implementation calculations shall be made available to review by the Independent Review Teams.

J. Participation requirements

26. A Party not included in Annex I to the Convention may participate in the Convention Market Mechanism through the implementation of emission reduction policies and/or measures and issue, acquire or transfer CMU if:

a. It has ratified the legal outcome of the Ad Hoc Working Group on the Durban Platform;

b. Its implementation proposal for the implementation of the Convention Market Mechanism for a broad segment of the economy, in accordance with the provisions contained in this Annex, has been reviewed by an independent review team and found compliant with criteria set out in Appendix I to this Annex;

c. It has in place a system for monitoring and reporting of emissions in the broad segment of the economy, in accordance with provisions contained in this Annex;

d. It has in place either arrangements for the use of an international registry administered by the UNFCCC secretariat or a national registry which has been reviewed by the International Registry Administrator and found to be compliant with the criteria set out in Appendix III;

e. It has designated a National Implementation Authority (NIA) responsible for the domestic implementation of the Convention Market Mechanism and for the compliance with its modalities and procedures and other relevant guidelines and international rules;

f. It has submitted the latest mandated national inventory of greenhouse gases emissions, in accordance with guidelines on national greenhouse gas inventories, and provisions on international consultation and analysis contained in Decision 1/CP.17.

K. Use requirements

27. CMU issued under the Convention Market Mechanism may be transferred to the national registries of Parties included in Annex B of the Kyoto Protocol for use towards compliance with their inscribed quantified emission limitation and reduction obligations.

28. A Party to the Convention may use CMU towards compliance with any commitments under the legal outcome of the Ad Hoc Working Group on the Durban Platform, if:

a. It has ratified the legal outcome of the Ad Hoc Working Group on the Durban Platform, or otherwise signified its willingness to be bound by its disciplines;

b. It has completed the international assessment and review process of the latest required biennial report in accordance with the biennial reporting guidelines for developed country Parties in accordance with Decision 2/CP.17 (articles 23 to 31) or it has completed the international consultation and analysis process of the latest required biennial report in accordance with the biennial reporting guidelines for developing country Parties in accordance with Decision 2/CP.17 (articles 39 to 44).

Part IV Procedures

L. Submission of proposals

29. A Party wishing to pursue an implementation proposal of the Convention Market Mechanism shall provide a proposal document which shall include all elements listed in article 14 above.

30. Submission of implementation proposals shall use a common template. This common template shall be developed by the Implementation Committee and approved by the Conference of the Parties. A draft common template is included in Appendix V to this Decision. This draft common template shall be used for the submission of implementing proposals prior to the approval of the common template.

M. Review of Implementation Proposals

31. Upon receiving an implementation proposal from a National Implementation Authority, the Executive Secretary shall convene an Independent Review Team for its review.

32. Within [90] days, the Independent Review Team shall, through a review report, review the proposal for implementation and shall raise any questions of implementation to the Implementation Committee. If the Independent Review Team raises no implementation questions, the proposal is deemed suitable, and the administrator of the International Transaction Log and the Implementation Committee are notified by the Executive Secretary.

33. If the Independent Review team raises questions of implementation, these shall be forwarded to the Implementation Committee. Upon receiving these, the Implementation Committee shall forward these questions, along with any other questions it may deem necessary, to the National Implementation Autority(ies) submitting the proposal.

34. The National Implementation Authority(ies) shall respond in writing within [90] days and may have the right to hearing before the Implementation Committee.

35. The Implementation Committee notify the Party once it is satisfied that all questions of implementation related to the Party's implementation proposal have been adequately resolved. In addition, it shall inform the manager of the respective registry of its notification and provide information required for issuance of units.

36. Upon being notified, the National Implementation Authority shall proceed to implementation of the proposal and establish the start date of implementation.

N. Annual reports

37. Yearly upon the start date of implementation, the National Implementation Authorities shall submit annual reports to the Executive Secretary who shall promptly convene an Independent Review Team.

38. Within [90] days, the Independent Review Team shall review the annual report and, through a review report, shall raise any questions of implementation to the Implementation Committee.

39. If the Independent Review team raises questions of implementation, these shall be forwarded to the Implementation Committee. Upon receiving these, the Implementation Committee shall forward these questions, along with any other questions it may deem necessary, to the National Implementation Autority(ies) submitting the annual report.

40. The National Implementation Authority(ies) shall respond in writing, within (30/60/90 days) and may have the right to hearing before the Implementation Committee.

41. The Implementation Committee shall notify the Party, once it is satisfied that all questions of implementation related to the Party's annual report have been adequately resolved. In addition, it shall inform the manager of the respective registry of its notification of the annual report. In the case of a crediting implementation track, it shall submit to the manager of the respective registry the information required to issue credits.

O. Registries and the International Registry and Transaction Log

42. Six months prior to issuance of units, Parties shall notify the Implementation Committee and the operator of the International Registry and Transaction Log of their intention to either use a national registry or an International Registry operated by the administrator of the International Transaction Log of the Kyoto Protocol

43. Parties intending to use their national registry for issuance of units shall ensure that technical specifications of their national registries follow those of the international registry and ensure connectivity with the International Transaction Log.

44. Technical specifications for data standards shall be developed by registry experts in consultation with the administrator of the International Transaction Log under the Kyoto Protocol and shall be submitted for decision by the Conference of the Parties.

45. Modalities for accounting of units under the Convention Market Mechanism shall follow closely, and be compatible with, modalities for accounting of units under the Kyoto Protocol.

P. Issuance

46. For the crediting implementation track, issuance of CMU shall take place once a satisfactory review of the proposal document and of the annual report for the relevant year has been undertaken, without outstanding questions of implementation. Convention Market Mechanism units (CMUs) shall be issued in respect of the difference between the emissions stated in the annual report and the crediting threshold established in the implementation proposal for the respective year.

47. For the trading implementation track, issuance of Convention Market Mechanism units (CMUs) shall take place once a satisfactory review of the proposal document has been undertaken. Upon such satisfactory review of the proposal document, CMUs shall be issued in relation to one year of the relevant trading period, for the amount corresponding to the trading cap in the proposal document. Issuance of CMUs for subsequent years shall depend on satisfactory review of the annual reports in respect of previous years. If the review concludes that emissions during any previous year were in excess of allowances issued in respect to the trading cap to the same year, the National Implementation Authorities are required to make up for the shortfall by forwarding an equivalent amount of any compliance units to a cancellation account operated by the administrator of the International Transaction Log or deduct the shortfall of CMUs from future issuance of CMUs.

Q. Appeals

- Provisions on how to file appeals against decisions of the independent committee;

R. Compliance

- Only relevant for trading implementation track

S. Enforcement

- Only relevant for trading implementation track

Appendixes

Appendix I: Criteria for Proposal Documents

Appendix II: Guidelines on Data Quality

- sectoral emission inventory data scrutinized by "ERT"-like body; compatibility with national-level emission inventory
- review of monitoring and reporting and provisions at chosen coverage level within national system for inventory
- requirements on definition of coverage and traceability to national inventory

Appendix III: Requirements for the Operation of National Registries

Appendix IV: Terms of Reference for the Implementation Committee

Appendix V: Draft Common Template for submission of implementation proposals

8 Stocktaking of and recommendations for Capacity Building Initiatives for New Market Mechanisms

Work package 7, background paper 1, by Axel Michaelowa, Sonja Butzengeiger, Björn Dransfeld (Perspectives), Martin Stadelmann (University of Zurich), 15 November 2012

8.1 Context / Requirements for capacity building for NMM

8.1.1 General Principles of NMM

The new market mechanism (NMM) as defined by paragraph 83 of Decision 2/CP.17 (UNFCCC 2012a) is to operate according to the principles laid out in paragraph 79 of the same decision, i.e. meet standards that deliver real, permanent, additional and verified mitigation outcomes, avoid double counting of efforts, and achieve a net decrease and/or avoidance of greenhouse gas emissions. It also notes that Parties shall develop and implement such approaches in accordance with their respective national circumstances – be it individually or jointly.

To date the design of a NMM is not clear. But translating a whatsoever NMM framework into practice, i.e. custom tailoring a NMM design for implementation under specific national circumstances in a certain host country will in the first place rely on domestic capacities. As these political, technical and institutional capacities may not exist to the extent needed, capacity building activities may hence serve as catalysts for enabling countries to engage under the NMM.

8.1.2 Experiences with capacity building for market mechanisms in the past

Over the past two decades vast experiences with capacity building for market mechanisms have been gained in the field of international climate policy: For instance, the EU Commission ran an intensive capacity building road show before phase I and phase II of the EU ETS, explaining legislation and procedures of the scheme to member state politicians and governmental staff, operators or verifiers – an enterprise that better enabled countries and stakeholders to cope with the introduction of the instrument. With respect to activities in developing countries experience with the Clean Development Mechanism (CDM) and its precursor Activities Implemented Jointly (AIJ) has shown that capacity building was crucial in generating a critical mass of knowledge to engage in project development. It was in particular a necessary condition for the takeoff of CDM in the major CDM destinations India (Babu and Michaelowa 2003, Deodhar et al. 2003) and China (Schröder 2012). In the early 2000´s the emerging CDM raised the attention of several bilateral and international donors, e.g. development agencies, multilateral institutions such as the World Bank or UN agencies. The World Bank´s National Strategy Studies programme (described in Textbox 1) for example was an important catalyst for CDM institution building in host countries. From 2006 on, also capacity building for CDM Programmes of Activities (PoAs) quickly expanded, reaching more than 30 activities in 2010 (Stadelmann and Michaelowa 2011).

But CDM capacity building was not without its challenges, which e.g. included workshop tourism, a focus on printed manuals outdating quickly, donor competition and the interest to source cheap emission credits as well as host country institutions becoming dependent on capacity building funds from abroad (Michaelowa 2005). Even more, Okubo and Michaelowa

(2011) found that capacity building is not a sufficient condition for CDM investments and that the substantial capacity building funds poured into Sub-Saharan Africa did not lead to project development in most of these countries. Furthermore, capacity building programmes often substantially overlapped and were not necessarily country-driven. Successful outcomes were mainly achieved if generic capacity building was complemented by targeted project development support and institutional capacity building (Okubo and Michaelowa 2010, Stadelmann and Michaelowa 2011).

Textbox 1: The World Bank's National Strategy Studies Programme

The World Bank's National Strategy Studies (NSS) programme played a key role in initial CDM and JI capacity building (Michaelowa 2005). The studies under the programme aimed at estimating the CDM/JI potential of 16 countries with the following elements:

- Description of the CDM
- Estimate of demand and supply on the international greenhouse gas market
- Estimate of costs and scope of greenhouse gas abatement options in the host country
- Institutional requirements for CDM
- Description of a project pipeline.

Each NSS would be financed by one industrialized country; the World Bank played a relatively limited role in financing, but asserted an important one when it came to content. Interestingly, smaller countries were quicker in negotiating NSS terms with the World Bank. Larger host countries were sometimes sceptical and the negotiations took long. A prime example is India that only started its NSS in 2003. After initial experiences with uncoordinated writing of the chapter on the international greenhouse gas market, the World Bank hired Swiss consultants Gruetter to develop an easy-to-operate general equilibrium model of the global market. This "CERT model" was useful in giving some idea about market prices and overall demand and prevented wasting of too many precious human resources on guessing about international markets. At the same time, in the NSS programme the World Bank also promoted its own agenda, particularly concerning the development of a project pipeline for its Prototype Carbon Fund (PCF). This role of the World Bank sometimes led to conflict with the financing country and to long delays in publication of the studies. Therefore, Germany made its financial contributions with the condition that it would retain control over the content and could decide unilaterally when a report would be fit for publication.

Always a team of host country consultants would be in charge of writing the NSS report while consultants from the Annex B country financing the NSS would support them. Often, however, the Annex B consultants played a major role which de-facto limited the degree of capacity building.

Usually, a NSS took 18 months to be completed but in some cases it dragged on for three years. Main reasons for delay were insufficient ownership of the host country, conflicts about the allocation of financial resources, lack of competence and slow allocation of experts by the Annex B consultancy. An instructive case is Indonesia that had decided to separate its NSS into an energy and a forestry part. The former was financed by Germany, the latter by Australia. While initially both parts were to be started in early 2000 and published jointly, it became clear quickly that the Australian part only progressed slowly. Eventually, the German NSS was published in September 2001 and the Australian one more than two years later.

To sum up, the year-long experience has shown that capacity building can play a very helpful, fundamental role for putting new market mechanisms into practice. But the main lessons learnt are that capacity building programmes need a careful set up in order to be effective. Thus, capacity building shall - inter alia -:

- be host country orientated, i.e. ensure a real transfer of resources (here mainly knowledge) to the host country and its respective institutions;
- target and engage relevant stakeholders in the host country, both public and private;
- be conducted by highly skilled technical experts;
- involve only low bureaucracy;
- provide a clear allocation of financial resources;
- limit the involvement of industrialized country resources.
- also support concrete activities to enable learning by doing

In addition, history has shown that lacking understanding of and confidence in the future design of a mechanism can become a major barrier for host country stakeholders willing to actively engage. This is in particular true for the potential demand for credits generated under the NMM, which serve as the main incentive for any host country to participate. Capacity building should thus illustrate the future demand for NMM credits to the extent possible.

8.1.3 Specific requirements as per UNFCCC decisions

A work programme for the NMM is to be set up leading to a decision at COP 18 (paragraph 84 of Decision 2/CP.17). Para 85 of this decision asks Parties to take their experiences, positive and negative, with existing approaches and mechanisms as well as lessons learned into account in their submissions regarding the work programme. While paragraphs 144 to 156 of the decision deal with capacity building, there is no specific mention of the NMM. So there is a high degree of freedom when it comes to capacity building activities for the NMM. In the submissions published until mid-April (also considering submissions of 2011), the need for and importance of capacity building is highlighted by both developing and developed countries. Table 1 summarized the positions with respect to capacity building for NMM. Most parties just note the generic need for capacity building for NMM, while some mention more specific needs, such as technical, political and legal capacity. China and the LDCs mention that the programmes may focus on LDCs and African countries.

Table 9: Party views on capacity building for NMM (Full wording in Annex 1)

Party	Need for capacity building	Focus on LDCs/Africa	Technical capacity (data, MRV)	Political capacity	Legal capacity	Capacity via pilots
EU	Yes		“Institutional capacity”			
LDCs	Yes	Yes				
New Zealand	Yes					
Norway	Yes					Yes

China	Yes	Yes				
Turkey	Yes		Yes	Yes	Yes	(Yes)
AOSIS	Yes		Yes			
Papua New Guinea	Yes		Yes	Yes (for "design")		

Based on parties´ submissions to the AWG LCA (UNFCCC 2011, 2012b and 2012c)

8.2 Status quo of NMM capacity building initiatives

New carbon market mechanisms, such as sectoral crediting, sectoral trading or even NAMA crediting, will require substantial knowledge, e.g. for data collection and monitoring (Schneider and Cames, 2009; Aasrud et al., 2010; Fujiwara et al., 2010). Given the uncertainty on when and if new market mechanisms will be established, it is not surprising that capacity building efforts for new market mechanisms have been very limited until now.

Most capacity has been built in the area of REDD+, as many private actors expect an integration of REDD+ in carbon markets in the short term. As a major international programme, the World Bank's Forest Carbon Partnership Facility (FCPF) started in 2008 to build capacity in developing countries to harness funding through market-like approaches. Early lessons from the "readiness" phase of the FCPF are: different starting points of countries, need for integration into a low-carbon strategy, as well as lengthy and multistep process (pre-assessment, capacity building, design), see Chassard (2010). On the sectoral crediting / trading side, the first known capacity building tool were the Sectoral Proposal Templates (SPT) developed by GtripleC/Ecofys in 2006.

In the last two years, several capacity building activities for new market mechanisms have emerged. A number of national or multilateral initiatives addressing general mitigation issues such as low carbon/emissions development strategies (LEDS/LCDS) include activities that support NMM capacity (for instance the International Climate Initiative of the German Government, IKI), see also Aasrud et al. (2010). The most prominent initiatives with a clear focus on market mechanism capacity building are the World Bank´s Partnership for Market Readiness (PMR), the Mitigation Action Implementation Network (MAIN), the International Carbon Action Partnership (ICAP) and to some extent the Japanese Bilateral Mechanism. The four initiatives will be discussed below.

8.2.1 Partnership for Market Readiness

The World Bank led Partnership for Market Readiness (PMR) is a programme unveiled at the Cancun Conference in 2010 that includes 16 developing countries and is currently financed with 93.5 million $ from twelve donors, while the total budget aimed at is 100 million $ (see Table 2).

Table 10: PMR recipients and donors

Implementing Country Participants		Contributing Participants	Pledges in m $
Chile	Turkey	Australia	12.5

China	Ukraine	European Commission	6.5
Colombia	Brazil	Denmark	5.1
Costa Rica	India	Finland	5.3
Indonesia	Jordan	Germany	6.5
Mexico	Vietnam	Japan	14.4
Morocco	South Africa	The Netherlands	7.0
Thailand	Peru	Norway	5.8
		Sweden	6.0
		Switzerland	8.4
		United Kingdom	11.0
		United States	5.0
		Total Pledges	*93.5*

Source: Based on PMR (2012)

The PMR's remit is relatively broad, covering identification of suitable market instruments and sectors, coordination with relevant ministries and key domestic stakeholders, facilitation of data collection/management and establishment of reference levels, development of MRV elements, registries and transaction logs. It also wants to help setting goals and preparing legal and regulatory frameworks as well as supporting government engagement, responsibility, and institutional capacity for managing technical and policy components. Finally, pilot initiatives for domestic cap and trade schemes, scaled-up crediting or other new, innovative instruments are to be supported. The PMR is overseen by the Partnership Assembly consisting of all donors and recipients. Each participating country will receive at least 3 million $.

There are three stages of the PMR process. After initial selection, which is closed since October 2011, selected countries develop an Expression of Interest. They then get a grant of 35,000 $ to prepare an organizing framework for the scoping of the PMR activities, which needs to be vetted by the Partnership Assembly. Once this has been done, 315,000 $ are available to develop a Market Readiness Proposal.

As per October 2012, fifteen countries had reached the third phase. Turkey and Ukraine aim towards emission trading, Colombia, Costa Rica, India, Indonesia, Jordan, Mexico, Morocco and Vietnam pursue sectoral or scaled up crediting mechanisms, while Brazil, Chile and Thailand pursue both approaches. Finally, South Africa is interested in a carbon tax, domestic offsets and may be also in emission trading at a later stage. Chile, Costa Rica, China and Mexico have submitted their draft Market Readiness Proposals, which are now under review by experts.

8.2.2 Mitigation Action Implementation Network (MAIN)

The Mitigation Action Implementation Network (MAIN) is coordinated by the Center for Clean Air Policy (CCAP), a US-based think tank that has a long history in supporting capacity building for market mechanisms. CCAP is especially known for its high-level dialogue approach, while its analytical capacity is more limited; it builds essentially on meta-analysis of research done in other institutions. MAIN, which is also supported by the World Bank and the German Ministry of Environment, has the target to support the design and implementation of NAMAs and Low-Emissions Development Strategies (LEDS) in developing countries through regionally-based dialogues, web-based exchanges, and practitioner's networks; it thus follows CCAP's core approach. The most successful developing country mitigation policies implemented to date are to be identified and used as lessons for other countries to achieve ambitious mitigation actions. Sub-targets are improvement of countries' capacity to design, plan and implement NAMAs that are consistent with any LEDS or national sustainable development plans. Moreover, collaborative financing is to be mobilized by providing strategies to make NAMAs attractive to possible funders from donor countries, including meeting expectations for monitoring, reporting and verification (MRV). MAIN is thus much broader than capacity building for NMM.

To date, MAIN is limited to Asia (China, Indonesia, Malaysia, Pakistan, Philippines, Thailand and Vietnam) and Latin America (Argentina, Chile, Colombia, Costa Rica, Dominican Republic, Panama, Peru and Uruguay) bypassing Africa.

MAIN is based on regional "academies" with a duration of 4 days bringing together policymakers from key ministries focusing on finance, climate negotiators, finance and MRV experts, and industry representatives, where NAMA successes as identified by CCAP will be discussed. These sessions are complemented by policy lunches and virtual "knowledge sharing" sessions through videoconferencing, webinars and e-learning courses.

So far, two academies were held in Latin America and one in Asia, with about 30 participants each. They discussed a template for supported NAMAs developed by CCAP, included role plays on NAMA scrutinizing by senior policymakers and assessments of the state of climate finance.

Overall it seems that MAIN is focusing on generating NAMA proposals for subsidies from industrialized countries, and that the role of market mechanisms in leveraging NAMAs is not addressed in detail.

8.2.3 International Carbon Action Partnership

ICAP, which was founded in 2007, is a partnership of public authorities and governments wanting to introduce mandatory emission trading systems with an absolute cap. Besides the EU member states, it includes the states of the Regional Greenhouse Gas Initiative (RGGI) in the Eastern US and of the Western Climate Initiative (WCI) in the US and Canada, as well as Australia, New Zealand and the municipality of Tokyo. Japan, Korea and the Ukraine are observers.

ICAP does capacity building for developing countries through dedicated Summer Schools, of which three have been held to date. They bring together for 25 to 30 carefully selected policy makers and other stakeholders from the non-governmental, academic and private sectors – traditionally less than 15% of applicants - for two weeks. Alumni work will help promote active virtual discussions among participants beyond the duration of the course.

Moreover, an 8-day training course on design, implementation, and administration of national and regional emission trading systems was held in Costa Rica in March 2012 where only about 20% of applicants were selected. Two conferences were held in 2009 (China) and 2010 (Tokyo); the former focused on emissions data management. ICAP is the only one of the surveyed initiatives providing hard-core technical training in a highly competitive environment. On the other hand, it is the most limited one regarding its scope.

8.2.4 Japanese bilateral mechanism

Japan has long criticized the Kyoto Mechanisms for being overly bureaucratic and thus created the concept of the Bilateral Offsets Crediting Mechanism (BOCM). While the detailed rules for the BOCM remain unclear, its preparation includes dialogues with developing countries, exploration of potential projects and capacity building, with the aim to enter into bilateral arrangements. To date, capacity building has mostly focused on MRV, with project feasibility studies limited to Japanese consultants. Bilateral MoUs have been established with Indonesia and Mongolia.

It remains to be seen whether the BOCM will represent a new type of market mechanism or whether it will simply form a copy of the CDM with watered-down MRV standards and lower environmental integrity.

8.3 First lessons from NMM capacity building initiatives

8.3.1 Evaluation of existing initiatives

The four initiatives differ regarding the selected target audience, the types of NMM addressed, the degree of host country involvement, the appropriateness of coverage, the content and the approach of the programmes (see Table 3).

With respect to the target group, MAIN addresses negotiators, which is appropriate in the initial phase of the NMM. While formally the other initiatives address all groups potentially involved in the NMM, PMR de facto concentrates on government officials. ICAP has the broadest approach, but it is unclear whether the extremely competitive selection of Academy participants favours certain groups.

Concerning the type of mechanism, MAIN does not have a clear focus at all and probably leads to an increased orientation of policy decisions on NAMAs towards subsidized NAMAs. PMR probably has the best balance in terms of NMM types targeted. With its limitation to emissions trading based on mandatory caps, ICAP has a focus which is too narrow for the large majority of developing countries.

Host country ownership is probably largest in PMR, where countries had to become proactive in the EoI phase. However, personal experience on the ground in the PMR context shows that this ownership can be rather shallow. Regarding coverage, duplication clearly exists between PMR and MAIN where the same donor (World Bank) is targeting seven countries in both initiatives. Appropriateness of coverage is generally relatively good, with the critical size of countries to engage in the NMM probably respected, as long as NAMA crediting could be implemented on a relatively small scale (the Dominican Republic might be the most extreme case). Content-wise, all initiatives except ICAP have some MRV elements and the PMR is probably most encompassing by targeting both capacity on identification and technical design of NMM. Finally, all initiatives except the Japanese BOCM use interactive workshops or meetings as key capacity building tool, while the PMR has the most elaborated approach, based on 3 stages: expression of interest, organizing framework and market readiness proposal.

Table 3: Focus of different capacity building initiatives

Initiative *Initiator*	Target group	Type of mechanism	Host country involvement	Coverage of countries	Content of capacity build.	Approach
PMR *World Bank*	Government officials	Different NMMs	Good (EoI needed)	Advanced and interested countries	NMM identifcation, MRV/data, baselines	3 project stages, assemblies
MAIN *CCAP*	Negotiators	NAMAs, NMMs	OK (dialogues)	Some overlap with PMR	MRV, co-financing, LEDS	Webinars, workshops
ICAP *EU, RGGI, WCI&others*	Academics	ETS	Rather questionable (as academics)	No particular focus	Design, implementation, administrat.	Summer schools
BOCM *Japan*	Governments, (project developers?)	Projects (and “activities”)	Ok (bilateral agreements)	Focus on Asian countries	MRV	Feasibility studies, online platform

EoI = Expression of Interests

8.3.2 Potential for improvements

The big general challenge of the NMM is how to generate trust among emitters that the NMM is a stable incentive for emission reduction. This requires credible governance, as well as demand for credits that can be generated from the NMM. The big shortcoming of all current capacity building initiatives is that once they are over and there is no demand for NMM credits, the capacity built will be lost rapidly. Experience from the CDM shows that the capacity building only triggered projects once there was demand generated. And here the limited demand from the World Bank’s Prototype Carbon Fund was less effective than the demand coming from multiple private entities covered by the EU ETS. In the future, this might also become a real threat for juvenile activities such as NAMAs or potential NMM actions. Before market-related demand can be created, a demand from public finance may help to test first NMM pilots that may enable early learning-by-doing.

8.4 Recommendations for the German Government

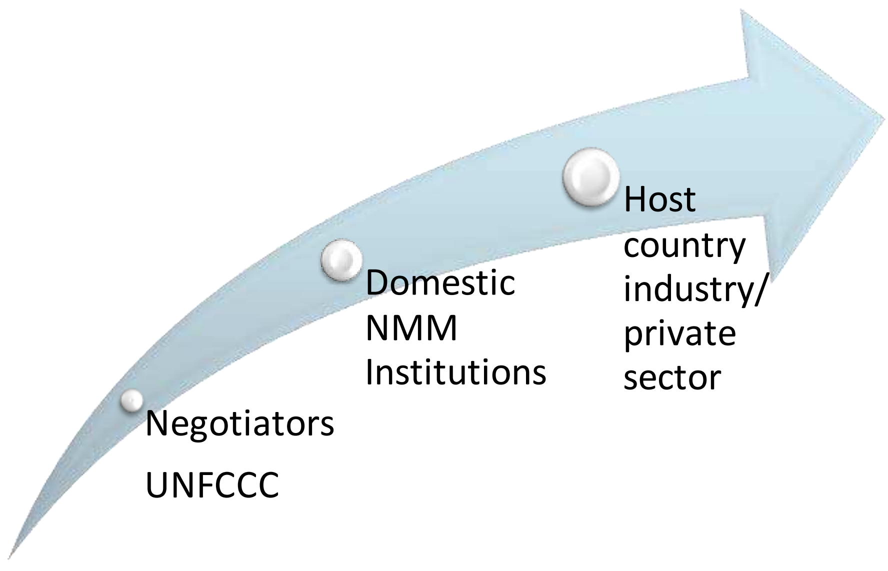
The NMM can take many forms; international negotiations on its design have just started. Looking at the experiences with capacity building for the Kyoto Mechanisms, capacity building for the NMM should be designed in a way that aims at:

- Enabling an informed participation of policy makers in the negotiations about possible designs of the NMM, and advantages/disadvantages of approaches;
- Allowing to effectively harness the potential for use of the NMM in the host country, i.e. capacity building on domestic implementation;
- Ensuring real ownership in the host country;
- Efficient spending of support.

We therefore recommend having a particular focus on the following aspects when designing an NMM CB programme:

Selection of relevant target groups & multi-tier approach: In the initial phase of NMM, policymakers should be targeted as they negotiate internationally. It is important for them to understand the opportunities, challenges and barriers of a NMM for their country. Besides, capacity building in phase I should focus on correct incentives for private sector mitigation activities, and/or proper policy instruments (in particular in case NMM targets sectors with highly dispersed, small emission sources). Once the design of NMM has been decided at UN level, it will be important to train both public institutions and the private sector in the host country how to implement and engage in NMM (these phases are summarised in Figure 20).

Figure 20: Suggested phases NMM capacity building



Phase I could be conducted in a style similar to the one successfully applied in the European Capacity Building Initiative (ECBI); i.e. through informal, facilitated discussions of policy makers that allow a comparatively open dialogue based on inputs through expert presentations.

- **Clear focus:** Given the unclear nature of the NMM, capacity building should not address all possible forms of the NMM, as due to country characteristics the most appropriate form (sectoral crediting, sectoral trading, NAMA crediting) may differ.
- **Host country ownership:** Often, capacity building grants are parachuted into host countries without a real interest on the ground. We recommend conducting a proper pre-implementation analysis assessing in detail key interest groups for the specific NMM under consideration. This assessment should also include an analysis of institutional continuity and staff exchange rates to make sure that transferred knowledge will remain. Finally, a pre-assessment may also analyse whether countries are really interested in NMM (e.g. availability of a strategy, willingness to contribute in-kind or other resources).
- **Avoidance of duplication**: There has been a tendency in the past to rush into the most attractive target countries while side-lining less attractive ones. This calls for good international coordination. We therefore suggest inviting major donors and capacity building providers (see above) to a coordinating dialogue.
- **Evaluation**: As Germany is involved in all three multilateral capacity building initiatives, it should also initiate a review of achievements of past efforts and an improvement of these initiatives in line with the discussion above.
- **Minimum capacity and appropriateness of the country for the NMM at start level**: There are many countries which structurally are not having the necessary infrastructure for use of the NMM nor the critical size. The CDM has shown that LDC´s and small island states have faced big hurdles in participating in the mechanism, even after receiving substantial capacity building support (Okubo and Michaelowa 2011). A more detailed evaluation of the reasons should be conducted once the general nature of NMM is clear.
- **Create pilots that enable learning-by-doing:** Besides the theoretical aspects discussed so far, we recommend creating learning-by-doing experiences. Testing NMM concepts in a couple of countries/sectors can create tremendous insights for all other interested Parties worldwide; in particular if the NMM implements a new conceptual approach that has not been tested by any / many countries yet.

We therefore recommend that the German government tenders e.g. three pilot NMM activities where Germany buys NMM credits. Countries could e.g. be defined as eligible to bid if they have reached the third phase of PMR. In order to generate a credible incentive, the pilot phase should run for 4-5 years (e.g. from 2015 to 2020), and credit volume should be significant, i.e. for instance exceed 100 million tons CO2e. Other donors could contribute financially. Selection criteria could be appropriateness of the NMM concept in the context of the country's mitigation potential, the willingness to provide co-finance and the existence of a NMM strategy that involves all key stakeholder groups, thus showing ownership. Moreover, the incentives to actually trigger mitigation should be scrutinized regarding their potential effectiveness.

8.5 References

8.5.1 Studies and UNFCCC decisions

Aasrud, A.; Baron, R.; Karousakis, K. 2010: Market readiness: building blocks for market approaches. Organisation for Economic Co-operation and Development / International Energy Agency, Paris

Babu, Y.; Michaelowa, A. 2003: Removing barriers for renewable energy CDM projects in India and building capacity at the state level. HWWA Report No. 237, Hamburg, November 2003, 52 pp

Deodhar, V.; Michaelowa, A.; Krey, M. 2003: Financing structures for CDM projects in India and capacity building options for EU-Indo collaboration. HWWA Discussion Paper No. 247, Hamburg, September 2003, 31 pp

Michaelowa, A. 2005: Creating the foundations for host country participation in the CDM: experiences and challenges in CDM capacity building, in: Yamin, Farhana (ed.): Climate change and carbon markets. A handbook of emission reduction mechanisms, Earthscan, London, p. 305-320

Michaelowa, A. 2003: CDM host country institution building, in: Mitigation and Adaptation Strategies for Global Change, 8, p. 201-220

Okubo, Y.; Michaelowa, A. 2010: Effectiveness of subsidies for the Clean Development Mechanism: past experiences with capacity building in Africa and LDCs, in: Climate and Development, 2, p. 30-49

Partnership for Market Readiness (PMR) 2012: Partnership for Market Readiness (PMR): Update Since PA3. PMR Secretariat presentations at the 4th partnership assembly meeting in October 22-24 2012, Sydney, Australia. http://www.thepmr.org/events/eventlist/pa/partnership-assembly-meeting-pa4-sydney

Schröder, M. 2012: Local climate governance in China, Palgrave Macmillan, Basingstoke

Stadelmann, M.; Michaelowa, A. 2011: How to enable the private sector to mitigate? Building capacity and creating an enabling environment for low-carbon business activities in developing countries, Working Paper, Climate Strategies, Cambridge

UNFCCC 2012a: Report of the Conference of the Parties on its seventeenth session, held in Durban from 28 November to 11 December 2011. Addendum. Part Two: Action taken by the Conference of the Parties at its seventeenth session. Decisions adopted by the Conference of the Parties, FCCC/CP/2011/9/Add.1, Bonn

UNFCCC 2012b: FCCC/AWGLCA/2012/MISC.6, United Nations Framework Convention on Climate Change. http://unfccc.int/resource/docs/2012/awglca15/eng/misc06.pdf

UNFCCC 2012c: FCCC/AWGLCA/2012/MISC.4, United Nations Framework Convention on Climate Change. http://unfccc.int/resource/docs/2012/awglca15/eng/misc04.pdf

UNFCCC 2011: FCCC/AWGLCA/2011/MISC.2, United Nations Framework Convention on Climate Change. http://unfccc.int/resource/docs/2011/awglca14/eng/misc02.pdf

8.5.2 Websites

BOCM: www.mmechanisms.org/e/initiatives/index.html

ICAP: icapcarbonaction.com

MAIN: www.ccap.org/index.php?component=programs&id=43#

PMR: www.carbonfinance.org/pmr

8.6 Annex 1: Party views on capacity building for NMM

Party	Views (as expressed in NMM submission)
EU	"In order to maximize the function of new market-based mechanisms in developing countries, sufficient institutional capacities need to be developed in the sectors where the mechanisms are utilized. To this end, developed countries should actively provide capacity building in developing countries."
LDCS	"Appropriate and necessary capacity building activities should be provided to countries including, inter alia, the LDCs, SIDS and vulnerable African countries to promote their access to these market-based mechanisms, building upon lessons learnt from the CDM."
New Zealand	"Capacity-building to facilitate the use of the mechanism by Parties"
Norway	"Capacity building for market readiness and practical experience in establishing new marked based approaches is important. On-the-ground practical work is a very useful way to gain relevant experience. Norway participates actively in the market based mechanisms under the Kyoto Protocol, and we are engaged in several multilateral initiatives which will provide relevant experiences for Parties to draw upon. One such initiative is the Nordic Partnership Initiative on Up-scaled Mitigation Action (NPI). (...)"
China	"(...) necessary capacity building activities should be provided to countries including, inter alia, the LDCs and African countries to promote their access to the possible market-based mechanism."
Turkey	There will be a need for financing for the formation and readiness activities for new market mechanisms in the coming years. Capacity building activities in developing countries will not only consume finances and but also time. These activities will include activities in technical, policy and legal areas. Thus, it will be necessary to have a work program on the issue as soon as possible, broadly addressing the immediate needs such as MRV and piloting.

Party	Views (as expressed in NMM submission)
AOSIS	"Different sectors might be phased in for interested countries over time, once the necessary eligibility criteria are satisfied. Financial and technical support could be provided to improve the quality of inventories, develop consideration of possible sectoral baselines and facilitate eligibility for participation."
Papua New Guinea	"44) Capacity building is a prerequisite for the development, deployment and implementation of such market based approaches. 45) International institutions will have to be designated to provide the finance and the expertise in this area, while avoiding duplication and reinventing rediscovering existing knowledge and experiences. (...) 48) Any new market based approaches proposed above will require capacity building related to: a. Designing new approaches and tailoring existing ones to meet national circumstances. b. Data collection. c. Ensuring environmental integrity."

Based on parties' submissions to the AWG LCA (UNFCCC 2011, 2012b and 2012c)

9 New Market Mechanism Implementation Scenario – Piloting a sectoral crediting mechanism for the Peruvian residential sector

Work package 7, background paper 1, by Björn Dransfeld (Perspectives), 1 February 2013

The Durban conference (COP17) defined a "*new market-based mechanism" (NMM), operating under the guidance and authority of the COP, to enhance the cost-effectiveness of, and to promote, mitigation actions, bearing in mind different circumstances of developed and developing countries [...] which may assist developed countries to meet part of their mitigation targets or commitments under the Convention*". The details, scope and structure of the NMM were to be developed through parties in the course of 2012 and various parties and observers have submitted their views and positions on the future NMM design[37]. Also, detailed modalities and procedures were put forward by parties. Eventually, no decision on those rules for the NMM was made at the Doha conference in late 2012 (COP18). The collapse of the carbon markets in 2012 and the focus of COP18 on agreeing on the second commitment period of the Kyoto Protocol side-lined the new market mechanism issue during the Doha negotiations. Essentially, rule-setting for the top-down NMM and the bottom up framework for various approaches (FVA) was deferred to the 2013 COP 19 in Warsaw. Parties are now once more requested to submit inputs on the future outfit of the NMM (and FVA). It is worth mentioning that Doha confirmed the FVA to be developed under UNFCCC guidance, and that the NMM should include both project-based and sectoral approaches.

Given the current international demand-supply balance for tradable carbon units and credits and the carbon market price levels, there is no high pressure for decision makers to take action for an immediate introduction of the NMM. But with regards to the mid-term future it appears likely that the NMM (as well as the FVA) may become relevant pillars of the international climate policy regime. As the carbon market is apparently facing a "hibernation" period for approximately the next 1-3 years, one could use the window of opportunity to embark on testing the practicability of new instruments, such as the NMM. The need for piloting activities under the NMM is thus highlighted in many party submissions. A NMM pilot activity could explore the challenges and opportunities of the embryonic NMM framework and provide early lessons. This is in particular true with regards to involving the private sector. If private sector investments are desired to be part of the future climate policy regime (i.e. via the NMM), investment security and certainty about specific design issues of the NMM are essential and should be reflected in pilot activities.

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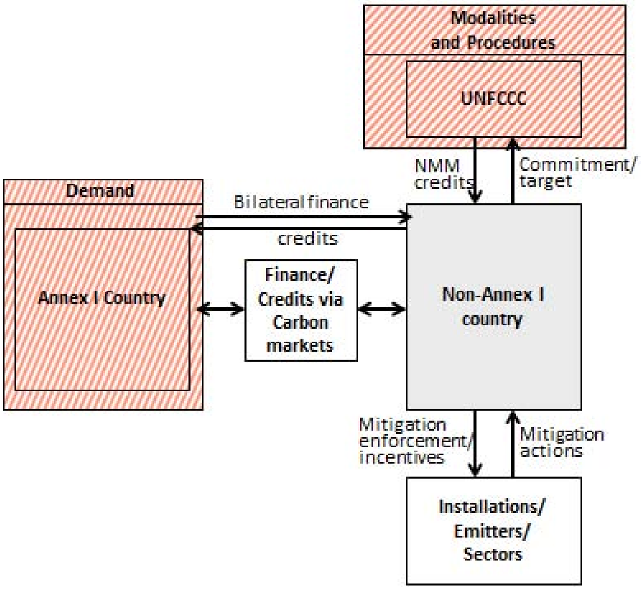
[37] See http://unfccc.int/parties_observers/ngo/submissions/items/3689.php and http://unfccc.int/bodies/awg-lca/items/4578.php.

As already outlined in submissions on the NMM, e.g. by the KfW[38], piloting activities for the NMM face the barrier that currently i) no rules and procedures are in place and ii) no demand for certified mitigation under the NMM exists. Setting up NMM piloting activities in absence of these two components requires vehicles that replace demand and provide modalities and procedures for those vehicles. Figure 21 illustrates the actors and components under the NMM and the lack of demand and rules.

Figure 21: Piloting NMM activities and currently lacking components (in red)



Source: Perspectives GmbH

In practice these lacking components for NMM piloting activities can be created in a setting that involves the partner country as well as actors willing to buy credits[39]. Such a joint piloting activity would thus most likely be set up as an agreement between two parties or amongst a group of parties.

9.1 NMM Implementation Checklist

For the time being (i.e. until the COP approves NMM modalities and procedures), the modalities and procedures that were developed by parties over the course of 2012 can be considered as relevant enough to test their applicability. Based on the submissions of the EU and Bangladesh, Cameroon, Central African Republic, Congo (Republic), Costa Rica, Cote d'Ivoire, Democratic Republic of Congo, Dominica, Dominican Republic, Fiji, Gabon, Ghana, Guyana, Honduras, Kenya, Pakistan, Panama, Papua New Guinea, Sierra Leone, Solomon Islands, Suriname and Uganda (UNFCCC 2012a&b), we developed a NMM implementation checklist that can be used

38 KfW submission on the NMM, July 2012 (http://unfccc.int/resource/docs/2012/smsn/ngo/249.pdf).

39 On the European level a window of opportunity to use credits from NMM, perhaps in combination with an increased target till 2020 may be generated (e.g. under the EU ETS or Effort Sharing Decision).

for NMM piloting activities for demonstration of compliance with international modalities and procedures.
As per the submissions, one can compile a checklist for host country requirements. After consolidating elements and requirements, we derive the following set of categories:

- Host Country & Participation Requirements
- Description of sector coverage for NMM activity
- Measures to be applied under NMM activity
- Institutional Arrangements
- MRV Arrangements
- Baseline Determination
- Projection of Emission Reductions and Thresholds/Targets
- Co-benefits & required support

A template for the checklist is provided in Annex I. For illustrative reasons the checklist is applied to the Peruvian residential sector below.

9.2 The Peruvian residential sector

In 2009, energy consumption in the Peruvian residential sector, commercial and public was 175,655 TJ with a share of 29.0% of total primary consumption. Compared to the previous year the energy consumption increased by 5.7% (MINEM 2010, p. 9, 22). Although total CO_2 emissions increased steadily during the last years - corresponding to the increase in energy consumption – the CO_2 emission from the residential and commercial sector was steady since 2004, reaching about 1.8 million tCO_2/a (MINEM 2010, p. 31). The main source of emissions from the residential sector is the use of energy related to the combustion of fossil fuel and non-renewable biomass as well as electricity consumption from the grid in residential houses. The main energy sources are electricity, liquefied natural gas (LPG) and biomass (firewood). In the residential sector the energy demand is driven by the energy need of the inhabitants of the houses. Generally the main energy needs are heating, warm water supply, cooking, air conditioning and electric appliance. Thus, firewood is still prominent in the energy consumption mix of the residential and commercial sector, being used mainly for cooking with an efficiency reaching 10%. The demand for electricity and LPG have increased their participation in this sector at 26.8% and 16.9% respectively, while consumption of kerosene has decreased dramatically in the years 2004 to 2009 due to higher Selective Consumption Tax (ISC) (MINEM, 2010, page 22; Lazo and Rojas 2009, p.57). The final energy consumption depends on the other hand on the penetration rate of the services and appliance. For example, in urban areas the majority of houses use liquefied natural gas (LPG) for cooking purposes (63%), whereas in rural areas traditional cook stoves are predominately combusting fire wood (90%). Thus potential mitigation measures also have to be considered regarding the different services and appliances used in urban and rural areas and could consist of efficient cooking (LPG/ improved cookstoves), solar water heaters, energy efficient lighting, thermal insulation, efficient heating/ ventilation, PV onsite generation, etc. So far, there are no current national technical guidelines for the design and construction of buildings or urban development to improve energy efficiency and reduce environmental impact through reduced energy consumption (MVCS 2012).

Based on a business as usual (reference) scenario developed by Lazo and Rojas (2009) the energy demand of the Peruvian residential sector will increase until 2030 (approx. 30 - 40 % compared to 2009). The energy mix in the urban as well as in the rural sector is expected to be steady, consisting of fossil fuels, traditional fuels, i.e. firewood/manure, and electricity in urban areas, respectively mainly traditional fuel in rural areas. As a result also the GHG emissions from the sector are expected to increase over the coming years under a business as usual scenario. It has been assumed that by introducing energy efficiency measures (depending on the respective measures) for houses in urban areas a reduction of at least 15% of fossil fuel consumption can be reached; for rural areas 30-60% (considering improved cook stoves). In both urban and rural areas, it has been assumed that 20-30% less electricity demand can be reached (Lazo and Rojas 2009).

9.3 Implementation Scenario for the Peruvian Housing Sector

Subsequently, the NMM checklist is applied for the Peruvian residential sector for illustrative reasons.[40] Peru is considered as an attractive candidate for climate policy market instruments, as it has gained numerous experiences under the CDM, and is progressively engaging in the UNFCCC negotiations and for instance pursuing market opportunities under the World Bank Partnership for Market Readiness (PMR).

9.3.1 Host Country & Participation Requirements

Item	Comment
Is the introduction of NMM measures consistent with National Policies?	NMM measures in the residential sector would fit with Peru's political agenda and could complement on-going initiatives. According to Article 9 of Law No. 28611, General Environmental Law, the purpose of the National Environmental Policy is to improve the quality of life of people, ensuring healthy ecosystems, viable and functional in the long run and sustainable development of the country, through prevention, protection and recovery of the environment and its components, the conservation and sustainable use of natural resources in a responsible and consistent way (MINAM 2009). NMM measures would support and follow the general policy guidance for mitigation and adaption on climate change according to the first policy area, "Conservation and sustainable use of natural resources and biodiversity", of the General Environmental Law" (MI-

[40] The assessment was done to illustrate the application of the checklist, based on information available online. A more detailed analysis would be required to deepen the understanding of certain parameters/aspects.

Item	Comment
	NAM 2009, p. 23): a) Encourage the implementation of measures to mitigate and adapt to climate change with a preventive approach, considering the characteristics of the various regions of the country, with emphasis on the situation and spontaneous action adaptation of peasant communities and indigenous peoples. b) Establish monitoring systems, early warning and timely response to natural disasters associated with climate change, giving priority to the most vulnerable populations. c) Encourage the development of forestry projects, solid waste management, sanitation/refurbishment, use of renewable energy and others to contribute to the mitigation of climate change. d) Conduct the processes of adaptation and mitigation to climate change spreading their consequences, and to train the various social actors to organize. e) Promote the use of adequate and appropriate technologies for adaptation to climate change and mitigation of greenhouse gases and air pollution. Besides this, a national strategy for climate change is in place.
Is the host country ready to buy additional, comparable emission reduction units on the global carbon market in case actual emissions have exceeded the target for the relevant year?	Theoretically yes: Peru has been actively engaged in the CDM (i.e. Interaction with the International transaction log, ITL) and is also currently exploring market opportunities under the World Bank PMR. Although, no provisions have been made as of now for buying credits under the NMM.
Findings	In general, no provisions exist that would prevent the implementation of NMM activities. Thus, NMM measures can be introduced in Peru.

9.3.2 Measures to be applied under NMM activity

Item	Comment
Shall the NMM activity choose a crediting or a trading route?	For the residential sector crediting appears more suitable. To be further explored.
Specify the measures to be applied in the sector under the NMM	Under the NMM piloting activity, primary energy consumption benchmarks based on a whole house measurement could be introduced. The construction of houses according to the benchmark level would be incentivized by a scaled-up financial promotion system. The programme would promote energy efficiency measures and renewable energies for new residential houses in urban and rural areas. • Urban areas: efficient cooking (LPG), solar water heaters, tank-

Item	Comment
	less gas boilers, energy efficient lightning, thermal insulation (e.g. of walls/roofs and improved windows), efficient heating/ventilation, efficient air conditioning, etc. • Rural areas: efficient cooking (improved cook stoves), solar water heaters, PV on-site generation, energy efficient lighting, thermal insulation (e.g. of walls/roofs and improved windows), efficient heating/ ventilation, etc. The NMM pilot envisages providing financial incentives to the target groups of house-buyers/owners and construction companies/developers to implement the energy efficiency and renewable energy measures. The financial incentive framework under the pilot shall ensure that the better the level of energy efficiency achieved, the more favourable the financial support conditions are and that the house-buyers/owners will receive a subsidy to the loan granted by a financial institution (e.g. reduced interest or lower reimbursement installments, or redemption grant), if they purchases a house built in accordance with whole-house energy efficiency standards under the pilot in order to cover a part of the additional investment costs (incremental costs). Additionally, construction companies (developers) shall receive a subsidized 'supportive loan' provided they commit themselves to build a house according to the whole-house energy efficiency standards under the pilot. The compliance have to be proven when the house is finished (MRV).
Description of ongoing activities with GHG benefits in the concerned sector.	So far, there are no current national technical guidelines for the design and construction of buildings or urban development to improve energy efficiency and reduce environmental impact through reduced energy consumption. Some NAMAs are planned for the building sector, though.
Findings	No current national technical guidelines for the design and construction of buildings or urban development to improve energy efficiency and reduce environmental impact through reduced energy consumption exist, hence the NMM measure would in general endeavor new mitigation impacts.

9.3.3 Description of sector coverage for NMM activity

Item	Comment
Is the same definition of the sectors, categories or sub-categories to be covered by the broad segment of the economy used as in other host countries? If not: • Is the deviation properly justi-	The second national communication does not provide a definition of the residential sector. Would need to be further explored.

Item	Comment
fied? • Is the definition subject but not technology specific? Is the definition including all covered installations/activities of the sector?	
Is an analysis of potential risks of carbon leakage including potential volumes available? If yes, does it describe measures to prevent or limit those effects?	Not applicable
Is an analysis of double counting including potential volumes available? If yes, does it describe measures to prevent or limit those effects?	There is no analysis of double counting including potential volumes available. But the possibility of double counting was considered for example for a cook stove PoA, and therefore the implementation of a NAMA database managed by the NAMA Unit is recommended. This could potentially also be expanded to other instruments such as NMM measures and hence provide value for a NMM pilot.
Findings	There are no existing national regulations with regards to GHG emission reductions in the residential sector. An exact definition of the residential sector would need to be provided, in order to provide clarity on the exact scope of a potential NMM measure. This applies also to double counting. Interestingly, various NAMA initiatives are put forward for the housing sector, hence one needs to account for overlap of NMM and NAMAs.

9.3.4 Institutional Arrangements

Item	Comment
Is a Designated National Authority for NMM implementation (and compliance with modalities and procedures for the NMM, other relevant guidelines and international rules) appointed and in place? Alternative: Which Entity could serve as the NMM DNA (e.g. CDM DNA)?	The CDM DNA is in place and with the Ministry of the Environment (MINAM). An alternative coordinating entity is the Ministry of Housing, Construction and Sanitation (Ministerio de vivienda, Construcción y Saneamiento - MVCS) and its Office of Environment (Oficina del Medio Ambiente (OMA)) The pilot could be coordinated by the Office of Environment (Oficina del Medio Ambiente (OMA)). The Office of Environment is the advisory body to coordinate specialized housing and administrative purposes at the level of the deputy ministry for Construction and Sanitation under the MVCS.

Item	Comment
	It aims to incorporate the environmental dimension in the process of generation of policies, programs, projects and technologies to guide the activities of the sector towards sustainable development. It also consolidates and strengthens the environmental management in the MVCS by incorporating it into the institutional dynamics especially in the process of policy formulation, sector planning and strategies. It shall guide the activities of housing, construction and sanitation to sustainable development and non-assignment planning, protection and recovery of the urban-rural and rural resources linked to sectoral activities. Alternatively, a Climate Change Unit in the Ministry of Economy and Finance is to be set up. It will focus on economic instruments and production of information/knowledge.
Are stakeholder dialogues institutionalized?	There is no specific dialogue institutionalized, but the institutional set-up and implementation of the pilot should start a dialogue with the following proponents: • Ministry of Energy and Mines (MINEM): technical support and monitoring; development and proposing energy policy • Peruvian Chamber of Construction (CAPECO): construction of houses and implementation of measures • Ministry of Environment (MINAM): technical support and monitoring; verification and certification of emission reduction and potential carbon credits • Servicio Nacional Capacitación para la Industria de la Construcción (SENCICO): public institution of Housing, Construction and Sanitation under the MVCS; research and capacity building under the programme • Peru Green Building Council (PGBC): technical support and promotion; research and capacity building; private organization who wants to lead the transformation of construction activities, and urban development towards a more sustainable reality • Ricardo Palma University, Lima: technical support and promotion; research and capacity building; training of professionals
Findings	No designated NMM authority is in place, but Peru has a broad range of experienced public and public/private entities in the field of climate change / building sector, which could serve as the respective counterpart for the NMM measure. Exact capacity building needs have to be further assessed. Potential overlap of work / synergies with the NAMA unit (see 4.6) needs to be considered.

9.3.5 MRV Arrangements

Item	Comment

Item	Comment
Is a national registry or arrangements for use of an international registry administered by the UNFCCC Secretariat in place?	A database to record and manage all relevant baseline and monitoring information for NAMAs will be developed and managed by a NAMA unit (see above and 4.6). This could be utilized for the NMM pilot measures as well. Monitoring reports will be prepared periodically which will aggregate all required monitoring information of the sampling group, i.e. monitoring records, in order to allow a third party verification.
Is adequate monitoring and reporting of emissions of the sector in place?	No, hence it recommended establishing a MRV system for the NMM pilot which should be based on direct GHG emissions by monitoring the energy use of the building. It should apply energy performance benchmarks based on a whole house energy performance **that still has to be defined and introduced**. The monitoring boundary should be each houses and building unit, respectively. The NAMA database (see above) will periodically prepare monitoring reports based on the monitoring records and according to the methodology, e.g. once every second year. The monitoring reports will aggregate all required monitoring information of the sampling group, i.e. monitoring records, in order to allow a third party verification. For the case of embarking on NMM activities (or pilots), this database could be used.
Is there a clear allocation of responsibilities for MRV & handling of data? (could also be moved up to institutional arrangements above)	The NAMA unit would be responsible for NAMA MRV systems, including the installation of metering systems, if required and hiring of the survey team, if applicable. Certain tasks and responsibilities for the management and operation of NAMAs could also optionally be outsourced on a commercial basis by the NAMA Unit. The overall responsibility for the MRV system, though, will stay with the NAMA Unit. This could be expanded to NMM activities, such as the pilot.
Are provisions for transparency of monitoring and reporting existent?	N.A.
Are provisions on data, sources, quality, use of factors including default factors and conservativeness established?	The monitoring should apply energy performance benchmarks based on a whole house energy performance that **has to be defined and introduced**. Besides it shall be based on appropriate elements of CDM methodologies, or other standards (VCS, UNEP) for the building sector.
Is the independent verification of actual emissions being exercised or planned?	Under the CDM, yes. To be further explored.
Findings	No dedicated MRV system (resp. its procedures) exists for the measure envisaged under the NMM. However, concepts for MRV of NA-

Item	Comment
	MAs in the residential sector are currently being elaborated. Again, a close collaboration with the NAMA unit is required to avoid overlaps.

9.3.6 Baseline Determination

Item	Comment
Does every sector, category or sub-category included in the broad segment of the economy in the host country have a separate baseline?	A Peruvian NAMA Unit will be responsible for the development of a database to record and manage all relevant baseline and monitoring information for NAMAs. The database will allow the NAMA Unit to calculate the corresponding baseline and NAMA emissions, as well as avoiding potential double counting of emission reduction under the NAMA and carbon projects (e.g. cook stove PoA). For the case of embarking on NMM activities (or pilots), this database could be used. The NMM pilot could separate the residential housing sector in rural and urban housing and set up different baselines for those subsectors.
Does the baseline include all relevant sources of GHG emissions in the sector?	The baselines would include the following sources of GHG emissions (all emissions from fuel combustion in households): • Solar thermal • Fossil fuels • Electricity • Traditional fuels
Does the baseline use the same methods and criteria for calculating baselines as in the same sector in different countries (e.g. IPCC approaches)?	Baselines for the residential sector are limited value. A business as usual (reference) scenario was developed by Lazo and Rojas back in 2009, hence one would need to update the baseline information.
Does the baseline period start no earlier than 01. January 2013?	N.A.
Does the baseline use the most conservative baseline scenario?	N.A.
Is the baseline data the most reliable data available, including actual sector data, and publicly available?	N.A.
Do the baselines take into account: • policies and measures includ-	N.A.

Item	Comment
ing those at an advanced stage of development • CDM projects • technological developments • population, • economic growth • other socio-economic factors?	
Are revisions every 5 years included in the proposal of the baseline period?	N.A.
If baseline period other than [5] years is proposed: is it sufficiently justified (e.g. due to unsuitability in the broad segment of the economy or consistency with mitigation pledges)	N.A.
Are the baselines guided by the following principles: • Accuracy, • Completeness, Reliability, • Sensitivity • Materiality, • Conservativeness, • Context • Transparency?	N.A.
Findings	Baseline scenarios are to be updated /have to be further or completely new developed for the residential sector in order to comply with the above requirements. The NAMA unit in this context is envisaging baseline studies.

9.3.7 Projection of Emission Reductions and Thresholds/Targets

Item	Comment
What are the expected emission reductions?	It has been assumed that by introducing energy efficiency measures (depending on the respective measures) for houses in urban areas a reduction of at least 15% of fossil fuel consumption can be reached; for rural areas 30-60% (considering improved cook stoves). In both urban and rural areas, it has been assumed that 20-30% less electricity demand can be reached (Lazo and Rojas 2009).
Is the threshold set according to (one/more) the following criteria?	Not defined yet.

Item	Comment
• In the range of 10-30% below baseline • Consider ghg mitigation potential, overall capability, financing received or expected and greenhouse gas mitigation pledges • Applying objective criteria (performance benchmarks, where feasible); • Following detailed rules on establishment of thresholds adopted by the COP	
Is the crediting/trading period consistent with the period covered by the developing country pledge for appropriate own action pre and post 2020	Not defined yet.
Does the stringency of the crediting threshold or sector target reflect respective capabilities in the sector and in the country?	Not defined yet.
Are thresholds consistent with broader agreed mitigation objectives of the host country?	Not defined yet.
Findings	Only vague information exists on planned emission reductions for the residential sector. A crediting threshold definition requires better projections.

9.3.8 Co-benefits & Required Support

Item	Comment
Is the implementation of the NMM contributing to sustainable development within the country? /	The NMM pilot would result in benefits other than GHG emissions reductions. These co-benefits will most likely include sustainable development benefits such as benefits to the economy (e.g. increase in number of jobs and reduced use of energy/natural resources), environment (e.g. reduction of air pollution) and population (e.g. improved quality of life). Environmental impacts: • Limiting local/regional air pollution • Reduce the irresponsible consumption of natural resources, • Limiting inadequate growth of cities, poor construction, applica-

Item	Comment
	tion of building materials and inappropriate designs, etc.
Are processes to ensure contribution of market mechanisms to sustainable development existing?	N.A.
Does the NMM contribute to domestic capacity building and economic development?	Socio-economic impacts of the NMM pilot: • Contribution to rural electrification; • Improved welfare and poverty alleviation; • Improvement health and quality of life • Reduction in fuel costs (energy expenditure); • Less time for women to spend collecting wood; • Reduced burden on limited natural resources (energy security); • Reaching a minimum comfort for housing
Does the NMM activity provide incentives for the private sector to engage and participate?	Construction companies (developers) shall receive a subsidized 'supportive loan' provided they commit themselves to build a house according to the whole-house energy efficiency standards under the NMM. The compliance have to be proven when the house is finished (MRV). Furthermore the envisaged training and capacity building for developers and construction companies as well the provision of information to house owners and buyers is planned. Additionally, through the pilot projects and marketing and advertisement activities the activity will help to raise awareness for energy efficiency. In addition, the pilot can support regional manufactures and companies with access to knowledge and capacity. However, the incentives for private actors will depend on the national layout the government applies for the NMM.
Is external capacity required for preparing / implementing the NMM activity?	In order to achieve the desired level of penetration with regard to the energy mix in the residential sector, however, additional funds are needed beyond what the Peruvian government can provide. Carbon finance, international donors and private finance would be necessary to expand the scope and impact of the sustainable housing initiative. The NMM pilot to be developed would provide an instrument to attract and leverage additional international funding through the carbon market to support sustainable development in the residential sector in Peru.
Findings	The activity could be expected to have positive effects and to contribute to sustainable development in the country. Support in the form of finance, technical aid and capacity building would be required (to be defined in detail).

9.4 Conclusion and Recommendations

The UNFCCC aims to build the rules and procedures of a NMM in the coming years. NMM pilot activities are desirable to inform the UNFCCC rulemaking as well as to convince partner countries that the NMM is an attractive carbon market mechanism. As already outlined in submissions on the NMM, piloting activities for the NMM face the barrier that currently i) no rules and procedures are in place and ii) no demand for any certified mitigation exists.

In this context it is recommended for the German Government to engage in a NMM piloting activity with selected partner countries (and possibly jointly financed with other industrialized countries), such as for the residential sector in Peru.

The NMM implementation checklist developed above can serve as a template for gathering information in a formalized fashion (for instance as a NMM Pilote Information Note).

In this context, the checklist based assessment for the Peruvian residential sector above makes clear that an introduction of the described NMM activity is generally feasible. Peru fulfills the generic participation requirements and has been actively engaged in pushing market instruments in the field of climate change, both on the national and international level. The institutional framework allows for a relatively professional dealing with an NMM activity. Currently no major national initiatives target the sector in the sense the NMM activity would do. On the other hand there is strong political commitment towards fighting climate change and also the residential sector has been identified as a potential contributor to reducing GHG emissions in Peru. In this context a couple of NAMA initiatives have been put forward, hence it is important to understand those NAMAs and their scope and to ensure that no overlap exists. MRV arrangements and baseline definition for the sector are juvenile, and so is the projection for emission reductions. Robust calculations for baselines and projections, and robust design for the MRV system are to be developed. While it is apparent that the NMM activity would result in positive co-benefits, the country requires support to successfully implement it. This comprises finance, technical aid and capacity building, of which all need to be further defined.

The short assessment for Peru above makes clear that the current provisions put forward in country submissions are relatively easy to meet, if the host country is generally positive towards market mechanisms. But the assessment also shows that a certain degree of international requirements for baselines and MRV will require host countries to provide data, run complex studies and set up robust schemes. This can become a major challenge for NMM activities.

Pilote activities could explore and experience these challenges in more detail. As the NMM is a market mechanism, the private sector (as demand source) should be involved in a NMM piloting activity. An important barrier to private engagement is that NMM credits cannot be used for compliance purposes (and a rather low demand for additional credits). In the context of a NMM pilot activity the German Government could contribute to overcoming the existing barriers, simulate the demand and for instance guarantee the purchase of a certain amount of credits at a certain price to establish an incentive for private sector participation.

9.5 References

FONAM (Fondo Nacional del Ambiente) Peru 2012: Peru Low Carbon Ecomomy – Carbon Projects, Voluntary Markets, REDD & NAMAs, http://www.fonamperu.org/general/mdl/documentos/Triptico Peru.pdf

Lazo, Oswaldo; Rojas, Jorge Luis 2009: Proyección del consumo de energía residencial en el Perú (2005-2030) mediante el software Maed_d. Revista de la Facultad de Ingeniería Industrial, Vol. 12(2): pp 50-60 (2009), UNMSM, ISSN: 1560 - 9146 (Impreso) / ISSN: 1810-9993(Electrónico)

MINAM (Ministerio del Medio Ambiente) 2012: AgendAmnbiente Perú 2013 – 2014, Agenda Nacional de Acción Ambiental – Propuesta 2012, http://www.minam.gob.pe/index.php?option=com_content&view=article&id=2237

MINAM (Ministerio del Ambiente) 2009: Politica nacional del Ambiente - Decreto Supremo Nº 012-2009-MINAM de 23 de Mayo de 2009. San Isidro, Lima, Perú

MINEM (Ministerio de Energía y Minas) 2010: Balance Nacional de Energía 2009: MINEM Dirección General de Eficiencia Energética

MVCS (Ministerio de vivienda, Construcción y Saneamiento) 2012: Normatividad para Edificaciones Bioclimáticas en el Perú; Electronic document, provided by e-mail on 10.08.2012

UNFCCC 2012a: Views on the new market-based mechanism. Submissions from Parties, Addendum, Agenda item 3(b)(v), Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Fifteenth session, part two, http://unfccc.int/documentation/documents/advanced_search/items/6911.php?priref=600007174#beg

UNFCCC 2012b: Views on the new market-based mechanism. Submissions from Parties, Addendum, Agenda item 3(b)(v), Ad Hoc Working Group on Long-term Cooperative Action under the Convention, Fifteenth session, Bonn, 15-24 May 2012, http://unfccc.int/resource/docs/2012/awglca15/eng/misc06.pdf

9.6 Annex I

The subsequent NMM implementation checklist for NMM piloting activities for demonstration of compliance with international modalities and procedures, was developed based on the submissions of the EU and Bangladesh, Cameroon, Central African Republic, Congo (Republic), Costa Rica, Cote d'Ivoire, Democratic Republic of Congo, Dominica, Dominican Republic, Fiji, Gabon, Ghana, Guyana, Honduras, Kenya, Pakistan, Panama, Papua New Guinea, Sierra Leone, Solomon Islands, Suriname and Uganda (UNFCCC 2012 a& B). The specific origins for individual items are provided in the "Reference" column.

9.6.1 Host Country & Participation Requirements

Item	Comment	Reference
Is the introduction of NMM measures consistent with National Policies?		Para 36, Page 11, EU, February submission and Para 42, Page 11, EU, February submission and Para 16, Page 9, EU, February submission and Para 37 Page 11, EU, February submission
Is the host country ready to buy additional, comparable emission reduction units on the global carbon market in case actual emissions have exceeded the target for the relevant year?	Indicators? CER trade?	Para 52, Page 11, EU, February submission

9.6.2 Measures to be applied under NMM activity

Item	Comment	Reference
Shall the NMM activity choose a crediting or a trading route?		Para 15, Page 9, EU, February submission
Specify the measures to be applied in the sector under the NMM		
Description of ongoing activities with GHG benefits in the concerned sector.		

9.6.3 Description of sector coverage for NMM activitiy

Item	Comment	Reference
Is the same definition of the sectors, categories or sub-categories to be covered by the broad segment of the economy used as in other host countries? If not: • Is the deviation properly justified? • Is the definition subject but not technology specific? Is the definition including all covered installations/activities of the sector?		Para 25, Page 10, EU, February submission and Para 8.1, Page 11, EU November submission and Para 26 Page 10, EU, February submission
Is an analysis of potential risks of carbon leakage including potential volumes available? If yes, does it describe measures to prevent or limit those effects?		Para 54, Page 11, EU, February submission and Para 4.2, Page 7, EU November submission and Para 27, Page 10, EU, February submission
Is an analysis of double counting including potential volumes available? If yes, does it describe measures to prevent or limit those effects?		

9.6.4 Institutional Arrangements

Item	Comment	Reference
Is a Designated National Authority for NMM implementation (and compliance with modalities and procedures for the NMM, other relevant guidelines and international rules) appointed and in place?		Paragraph 3.2, Page 6 and Para 3.4e page 7, EU November 2012 submission and Para 24, Page 10, EU, February submission

Item	Comment	Reference
Alternative: Which Entity could serve as the NMM DNA (e.g. CDM DNA)?		
Are stakeholder dialogues institutionalized?		

9.6.5 MRV Arrangements

Item	Comment	Reference
Is a national registry or arrangements for use of an international registry administered by the UNFCCC Secretariat in place?		Para 3.4d, Page 7, EU November submission
Is adequate monitoring and reporting of emissions of the sector in place?		Para 11.1 Page 14, EU November submission and Para 3.4c, Page 7, EU November submission
Is there a clear allocation of responsibilities for MRV & handling of data? (could also be moved up to institutional arrangements above)		Para 11.1 Page 14, EU November submission and Para 3.4c, Page 7, EU November submission
Are provisions for transparency of monitoring and reporting existent?		Para 11.1 Page 14, EU November submission and Para 3.4c, Page 7, EU November submission
Are provisions on data, sources, quality, use of factors including default factors and conservativeness established?		Para 11.1 Page 14, EU November submission and Para 3.4c, Page 7, EU November submission
Is the independent verification of actual emissions being exercised or planned?		Para 11.1 Page 14, EU November submission and Para 3.4c, Page 7, EU November submission

9.6.6 Baseline Determination

Item	Comment	Reference
Does every sector, category or sub-category included in the broad segment of the economy in the host country have a separate baseline?		Para 29, Page 11, EU, February submission and Para 9.1, Page 12, EU November submission
Does the baseline include all relevant sources of GHG emissions in the sector?		Para 9.1, Page 12, EU November submission and Para 31, Page 11, EU, February submission and Para 9.4 Page 13, EU November submission and Para 9.1, Page 12, EU November submission
Does the baseline use the same methods and criteria for calculating baselines as in the same sector in different countries (e.g. IPCC approaches)?		Para 9.1, Page 12, EU November submission and Para 31, Page 11, EU, February submission and Para 9.4 Page 13, EU November submission and Para 9.1, Page 12, EU November submission
Does the baseline period start no earlier than 01. January 2013?		Para 9.1, Page 12, EU November submission and Para 31, Page 11, EU, February submission and Para 9.4 Page 13, EU November submission and Para 9.1, Page 12, EU November submission
Does the baseline use the most conservative baseline scenario?		Para 9.1, Page 12, EU November submission and Para 31, Page 11, EU, February submission and Para 9.4 Page 13, EU November submission and Para 9.1, Page 12, EU November submission

Item	Comment	Reference
Is the baseline data the most reliable data available, including actual sector data? publicly available?		Para 9.1, Page 12, EU November submission and Para 9.1, Page 12, EU November submission
Do the baselines take into account: • policies and measures including those at an advanced stage of development • CDM projects • technological developments • population, • economic growth other socio-economic factors?		Para 30, Page 11, EU, February submission and Para 9.1, Page 12, EU November submission
Are revisions every 5 years included in the proposal of the baseline period?		Para 9.3a Page 13, EU November submission
If baseline period other than [5] years is proposed: is it sufficiently justified (e.g. due to unsuitability in the broad segment of the economy or consistency with mitigation pledges)		Para 9.3b Page 13, EU November submission
Are the baselines guided by the following principles: • Accuracy, • Completeness, Reliability, • Sensitivity • Materiality, • Conservativeness, • Context • Transparency?		Para 32, Page 11, EU, February submission and Para 28, Page 10, EU, February submission and Para 33, Page 11, EU, February submission

9.6.7 Projection of Emission Reductions and Thresholds/Targets

Item	Comment	Reference
Is the threshold set according to (one/more) the following criteria? • In the range of 10-30% below baseline • Consider GHG mitigation potential, overall capability, financing received or expected and greenhouse gas mitigation pledges • Applying objective criteria (performance benchmarks, where feasible); • Following detailed rules on establishment of thresholds adopted by the COP		Para 9.2 Page 12, EU November submission and Para 34, Page 11, EU, February submission
Is the crediting/trading period consistent with the period covered by the developing country pledge for appropriate own action pre and post 2020		Para 36, Page 11, EU, February submission and Para 42, Page 11, EU, February submission and Para 16, Page 9, EU, February submission and Para 37 Page 11, EU, February submission
Does the stringency of the crediting threshold or sector target reflect respective capabilities in the sector and in the country?		Para 36, Page 11, EU, February submission and Para 42, Page 11, EU, February submission and Para 16, Page 9, EU, February submission and Para 37 Page 11, EU, February submission

Item	Comment	Reference
Is the threshold set according to (one/more) the following criteria? • In the range of 10-30% below baseline • Consider GHG mitigation potential, overall capability, financing received or expected and greenhouse gas mitigation pledges • Applying objective criteria (performance benchmarks, where feasible); • Following detailed rules on establishment of thresholds adopted by the COP		Para 9.2 Page 12, EU November submission and Para 34, Page 11, EU, February submission
Are thresholds consistent with broader agreed mitigation objectives of the host country?		Para 36, Page 11, EU, February submission and Para 42, Page 11, EU, February submission and Para 16, Page 9, EU, February submission and Para 37 Page 11, EU, February submission

9.6.8 Environmental Impacts & Co-benefits

Item	Comment	Reference
Is the implementation of the NMM contributing to sustainable development within the country? /		Para 12.1 Page 14, EU November submission and Para 12.2 Page 14, EU November submission
Are processes to ensure contribution of market mechanisms to sustainable development existing?		Para 12.1 Page 14, EU November submission and Para 12.2 Page 14, EU November submission

Item	Comment	Reference
Does the NMM contribute to domestic capacity building and economic development?		Para 13 Page 8, EU, February submission and Para 17, Page 5, Bangladesh, 1… ; February submission
Does the NMM activity provide incentives for the private sector to engage and participate?		Para 13 Page 8, EU, February submission and Para 17, Page 5, Bangladesh, 1… ; February submission
Is external capacity required for preparing / implementing the NMM activity?		Para 13 Page 8, EU, February submission and Para 17, Page 5, Bangladesh, 1… ; February submission